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ABSTRACT

The major purposes of this study were: (1) to determine whether there were differences in student use of time in elementary schools; (2) to determine whether students who spend more time in reading and mathematics classes exhibit greater gains in reading and mathematics achievement; and (3) to determine whether there are quality measures of time which are related to achievement gains. It was hypothesized that the time factors of number of minutes of instruction, number of minutes that the student is on task, and the total amount of teacher time received by the student have no significant relationship with student achievement gains. Data were collected on 200 third grade students at three separate elementary schools in Wisconsin. Time utilization data included classroom observations at three separate periods during the 1979-80 school year. Achievement gains were determined from pretests and posttests. One-way analyses of variance were used to determine the relationships between background characteristics and time allocation measures. Major findings and conclusions include: (1) Significant differences exist in the amount of time available to individual students in reading and mathematics classes. (2) Allocated time in reading and mathematics varies significantly by school. (3) Students with greater amounts of allocated time exhibited significantly greater achievement gains in mathematics. (4) Time on task rates in reading and mathematics are significantly related to the student's school, teacher, and ability level. (5) Individual students receive significantly different amounts of teacher time in reading and mathematics. (Author/CJ)

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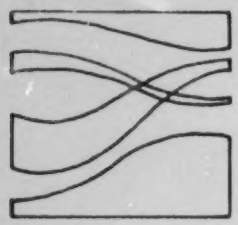

Technical Report No. 563

The Relationship of Individual Student Time Allocation to Reading and Mathematics Achievement

by Kerry Jacobson

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by

Kerry Jacobson

Report from the Project on
Studies of Administration and Organization for Instruction

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University of Wisconsin
Madison, Wisconsin

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Abstract

THE RELATIONSHIP OF INDIVIDUAL STUDENT TIME ALLOCATION TO READING AND MATHEMATICS ACHIEVEMENT

Kerry Ray Jacobson

Under the Supervision of Professor Richard A. Rossmiller

The major purposes of this study were: (1) to determine whether there were differences in student use of time in elementary schools; (2) to determine whether students who spend more time in reading and mathematics classes exhibit greater gains in reading and mathematics achievement; and (3) to determine whether there are "quality" measures of time which are related to achievement gains. It was hypothesized that the ways in which individual students utilized time would be related significantly to their achievement gains. Students were stratified by several background variables to determine the relationship of background characteristics to time allocation measures.

The major hypotheses of the study were:

1. The total number of minutes a student spends in reading and mathematics instruction has no significant relationship with that student's gains in reading and mathematics achievement scores.

2. The total number of minutes a student is on task in reading and mathematics has no significant relationship with that student's gains in reading and mathematics achievement scores.

3. The total amount of teacher time which a student receives in reading and mathematics has no significant relationship with that student's gains in reading and mathematics scores.

Data were collected on 200 third-grade students at three separate elementary schools in Wisconsin. Time utilization data included classroom observations at three separate periods during the 1979-80 school year. Achievement gains were determined from pre- and post-tests. One-way analyses of variance were used to determine the relationships between background characteristics and time allocation measures. Pearson product-moment correlations were calculated to test the major hypotheses.

The major findings and conclusions follow.

1. Significant differences existed in the amount of time available to individual students in reading and mathematics classes.

2. Allocated time in reading and mathematics varied significantly by school.

3. Students with greater amounts of allocated time exhibited significantly greater achievement gains in mathematics.

4. Individual students varied widely in their time-on-task rates in reading and mathematics.

5. Time-on-task rates in reading and mathematics were significantly related to the student's school, teacher, and ability level.

6. The actual amount of student time on task in reading and mathematics was related to the school the student attended.

7. Nonspecial students with greater amounts of time on task exhibited significantly greater achievement gains in mathematics.

8. Individual students received significantly different amounts of teacher time in reading and mathematics.

9. The amount of teacher time a student received in reading and mathematics was related to the student's teacher.

10. Lower-ability level students received significantly more teacher time in reading than did either high- or medium-ability level students. Medium-ability students received more teacher time than did high-ability students.

11. The amount of teacher time an individual student received in relation to other students varied by the method used to calculate teacher time.

12. Students with greater amounts of weighted teacher time exhibited less achievement gain in mathematics.

APPROVED: Richard A. Rossmiller

DATE: Oct. 7, 1980

CHAPTER I

INTRODUCTION

Educational researchers have focused a great amount of energy on efforts to understand why some students learn more or progress at faster rates than do other students. This issue has proven to be especially problematic when all of the students attend the same or a very similar school and are confronted with much the same circumstances. Initially, it was theorized that differences in educational achievement were due to the differential application of financial resources across school districts. This theory largely has been dispelled in this day of equalization when many branches of government have mandated and oversee a more equitable distribution of monetary resources to rich and poor districts, more or less ensuring each student a relatively equal opportunity for education (Coleman, 1966). The fact remains that there are still wide disparities between the achievement scores of apparently similar students, even where it appears that each has been supported by an equal amount of dollars. Moreover, the theory of inequitable access to resources cannot explain the wide gaps in student achievement within the same school district; that is, where per-pupil expenditures and other characteristics are quite similar.

As researchers have sought other possible explanations, such diverse variables as family background, teacher background, school

climate, community atmosphere, student characteristics, physical facilities, school organization, and many more have been studied (Thomas, 1962; Benson, 1965; Kiesling, 1967; Cohn, 1968; Hanushek, 1968). Some variables have been found to exhibit a statistically significant relationship to student learning in some studies, but none of them have been consistently found significant.

Recently, a new approach in explaining the elusive relationship between a wide range of background variables, educational institutions and processes, and differential student achievement has attracted attention. Instead of looking at particular background characteristics of students, parents, teachers, or schools involved, or at funding levels which districts provide, this new line of research has focused on questions concerning the allocation and utilization of time in classrooms. According to this view, the most important ingredient in a student's education is how time is employed--the way time is used profoundly affects student outcomes (Bloom, 1974). If education is seen as an incremental, growing process and if students learn by applying themselves over periods of time, then time becomes a crucial resource which must be considered as differentially affecting students in its uneven application. As a resource, time is as valuable as money and "wasted time" is, in fact, often equated with "money spent."

Various methods of accounting for time can be considered. A popular approach is to connect teacher time allocation to student

outcomes. Garner (1977) reported that it is not unusual to find some teachers within a grade devoting at least twice as much time to a subject as do other teachers in the same grade. This approach, however, has a shortcoming in that it is not necessarily the teacher's time that affects, determines, or quantifies student behavior. It is what the student does with his or her time which is ultimately the basis for all student outcomes. This leads to the conclusion that research should be concerned with student time allocation, not teacher time allocation (nor that of the principal, parents, etc.). The allocation of time by these other interested parties may influence student time usage, but they are at least once removed from the explanation for student achievement. The fundamental variable which first must be understood centers around student behavior--specifically, how the student uses time as a resource.

There are problems inherent in the study of student time allocation which must be addressed before a meaningful study can be undertaken. Several approaches have been tried--most of which base their results on student time allocation data which have been aggregated at district, school, or classroom levels. This method combines the time allocation and achievement data of all students within an educational unit in statistical analyses based on these averages. Aggregated data make it more difficult to find statistically significant results. Most educators agree, and research has generally shown (Murnane, 1980), that students within the same

class, school, or district vary at least as widely as do students in different classes, schools, or districts. When aggregated data are used, the very important distinctions between students are lost to the aggregated means. This results in a decrease in the variance associated with many variables. Because of this fact, it is apparent to many researchers that the focus, or unit of analysis, of a study dealing with student time allocation should be the individual student (Garner, 1978; Haggert, 1979; Rossmiller, 1979).

Another problem in studying time allocation is that time can be conceptualized as more than merely a quantitative measure. It may be that the "quality" of time used has an impact on the effect of that time on the student's education. For example, does the time spent in small group instruction have a greater impact on learning than time spent in large group instruction? If a teacher has used two hours in preparation for a class session, are the minutes in that class "worth" more than if the teacher had spent only one hour preparing? Is class time more valuable if an individual student is "on task" rather than "off task"? Answers to these specific questions are intertwined in a more general question: Can differences in student achievement be accounted for in terms of the ways in which individual students allocate their time?

Background of the Study

The Wisconsin Research and Development Center for Individualized Schooling is researching these and other related questions concerning the allocation of educational resources to individual students through the School Resource Utilization Project. The research seeks to identify those human and material resources that are significant inputs to an educational system and studies the effects of the differential application of these resources to individual students. The research has been guided by a conceptual framework for the economic analysis of schooling developed by Rossmiller and Geske (1977) (see Figure 1.1). According to this framework, educational systems consist of four major components: (1) the system environment and controls; (2) the school system itself, including human and material resources and the application of these resources; (3) the outputs of schooling; and (4) feedback based on evaluation of the outputs.

In an initial study, Rossmiller, using an educational production function technique, obtained and analyzed questionnaire data from 28 elementary schools regarding resource inputs, applications, and outputs of the educational process. It was obvious from this research that the process of schooling is a potentially valuable focus of study and that an in-depth analysis of classrooms is warranted (Rossmiller, 1978).

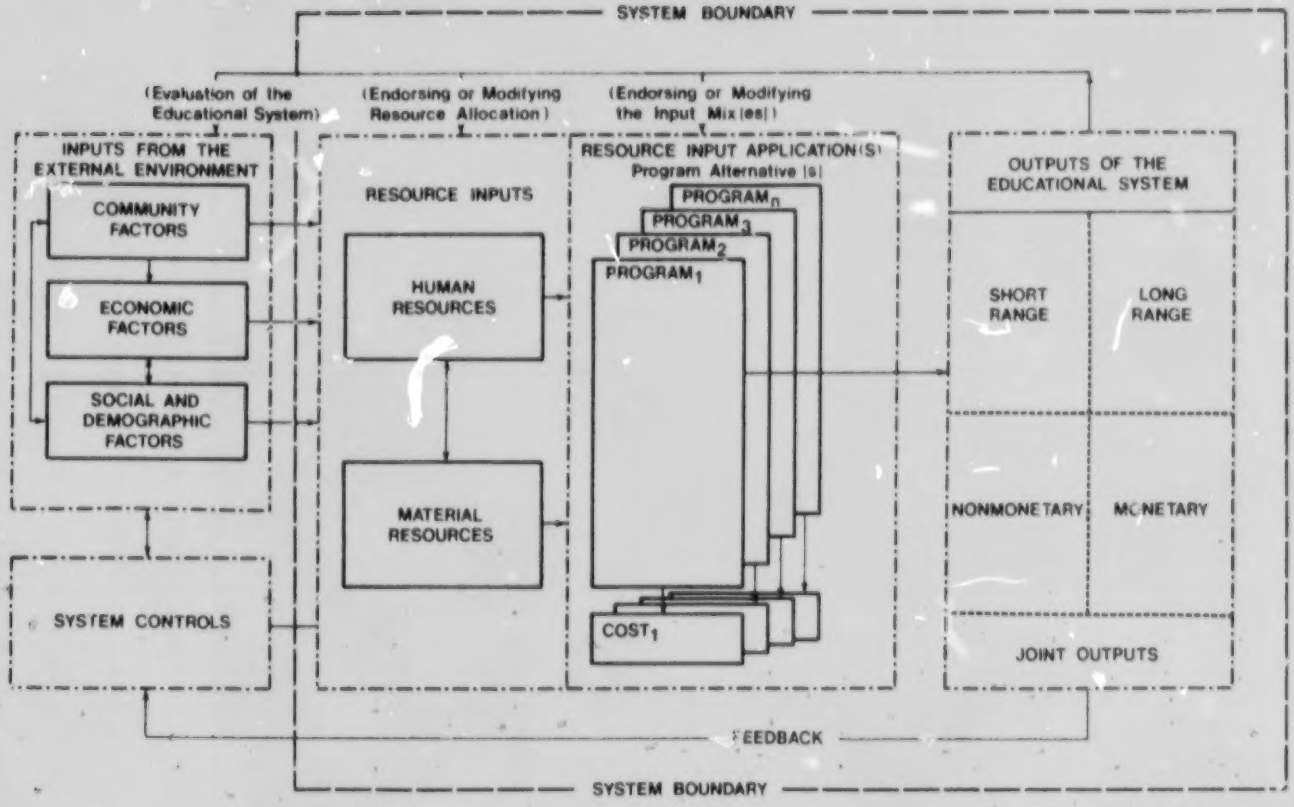

Figure 1.1. A Conceptual Framework of the Educational Production Process Under School Conditions.

Source: Rossmiller, R. A., & Geske, T. G. Economic analysis of education: A conceptual framework. Theoretical Paper No. 68. Madison, Wisconsin: Wisconsin Research and Development Center for Cognitive Learning, 1977.

With this in mind, this researcher undertook a broad study of the social and educational environment confronting students, gathering a great deal of information on the backgrounds of students, teachers, and administrators. A primary objective of the study is to identify precisely the application of resources within schools and classrooms and relate this application to specific outcomes of the educational system. In this research, each student is regarded individually since the inputs and outputs vary immensely in regard to particular students. The application of resources is considered largely a function of the time usage of individual students.

Statement of the Problem

In searching for an explanation for different achievement levels among students with similar backgrounds, researchers have hypothesized that the ways in which individual students use time as a resource can ultimately explain much of this difference. In this study the in-school time utilization of individual students is examined as both a descriptive measure and as an explanatory factor in the students' cognitive gains--particularly in reading and mathematics achievement.

Time is viewed as a resource which an individual student uses in many ways. While this research assumes that time is quantitative, it also hypothesizes that time has qualitative dimensions,

especially where instruction is concerned. Measures of the "quality" of time spent, such as time on task and teacher time, are also considered as influential factors in producing desired educational outcomes.

Review of Literature

The review of literature includes consideration of general systems theory, time as an educational resource, allocated time, time on task, and teacher time. It establishes the conceptual framework for this research including models for the study of time utilization. Findings of relevant studies from which this research derives direction and focus are summarized. Although the literature is replete with studies aimed at identifying educational resource usage, only those that directly impinge on this study are reported.

General Systems Theory

Attempts to identify factors which influence a student's educational attainment stem from a desire to increase the productivity of the resources devoted to schools. In these efforts, researchers have applied a technique popularized by Taylor (1911) for use in industrial and business settings. Known as scientific management theory, this method has gained general acceptance in education during the last 25 years. Subsequently, systems theory was developed which allows researchers and administrators to view

an entire school system, which is quite complex and often changing, as a single entity rather than as a disjointed conglomeration of buildings, people, techniques, and problems. Rossmiller and Geske (1977) summarized the many definitions of a system by stating that it is complex, it is composed of several elements, its elements are interactive, and both the elements and interactions are for some purpose.

The conceptualization of a large entity, such as a school district, a school building, or a classroom, as a system has allowed researchers to apply principles of economic analysis to the problems of education. Such analyses can, for example, ascertain the relative efficiencies of alternative inputs in the production of a given output. To educators, this translates into applications such as quantitative comparisons between alternative curricular programs or evaluation of the cost-effectiveness associated with supporting services. A systems analysis begins with a theoretical model and an hypothesized description of the system which then is tested as to its appropriateness.

A major application of systems analysis to education was done by Kershaw and McKean (1959) who attempted to compare school systems quantitatively. Following their work many other studies were done. These studies varied widely not only in sample size and makeup, but also in their measures of inputs and outputs. Not surprisingly, the variables that each researcher found to have a

significant impact on student outcomes were widely diverse also. Thomas (1962) found the salaries and years of experience of secondary school teachers, as well as the number of library books in a school, were related to student achievement. Benson (1965) found that instructional expenditures were important. Hanushek (1968) and Bowles (1970) found that teachers' verbal ability influenced their students' verbal abilities. In the many studies undertaken, a wide variety of inputs ranging from age of school building to pupil-teacher ratio have proven significant in affecting student educational outcomes.

The most widely discussed and controversial study was a report by Coleman in 1966. Financed by the federal government, the research consisted of a nationwide sample of 3,100 schools and was designed to prove that disparities in student achievement were a function of the inequitable distribution of educational resources. Instead, the research found a very strong relationship between the socioeconomic backgrounds of students and the achievement levels of students. The characteristics of a student's peer group were the next best predictors of academic achievement. Those variables commonly hypothesized as strong influencers, i.e., school finances, material resources, etc., did not add significantly to the ability to predict student achievement.

The results of the Coleman study generated considerable controversy and spurred reanalyses of the data. New research efforts

were undertaken to refute or modify what seemed to be a most startling proposition underlying the Coleman results, i.e., that schools don't make a difference. Researchers began to realize that there were weaknesses in methodology, as well as in some of the assumptions that had been taken for granted for so long. Brown and Saks (1978), two economists from Michigan State University, reminded researchers that education does not have, nor has it ever intended to have, a single outcome--student achievement. Instead, the aims of education range along a wide scale of cognitive, affective, and social skills so that researchers should not expect to find a one-to-one correspondence between resources and achievement. It is also important to remember that children are taught in classrooms. This creates a problem Brown and Saks referred to as "joint production." Any teacher must make a host of simultaneous value judgments regarding the level at which lessons are planned, as well as the ability level which will be the focus of instruction. In the majority of classrooms, it is impossible for the teacher to obtain the maximum achievement gain from every student. Some children will always suffer along some outcome dimension as a result of decisions, either conscious or subconscious, made by the teacher. Even though the teachers and students may be trying equally hard in two different classrooms, it can be shown mathematically that the average class gain will be altered by these decisions. Brown and Saks (1978, p. 7) stated, "It is easy to show that when the

distribution of skills among students changes, the relationship between inputs and average student achievement reveals little about teacher or other school input productivity." This jointedness of production dilemma poses problems for researchers when faced with the analysis of technologies operated by people with different sets of values.

The realization of this problem has caused researchers to reevaluate the appropriateness of the use of districts, schools, or even classrooms as the unit of analysis for educational research. As Brophy (1975, p. 2) pointed out,

> The student should have been the unit of analysis for most preceding classroom research, because most of the variables previously studied, including many of those often assumed to be stable and general characteristics, actually . . . vary with situation and context, and in particular with differences in student characteristics."

A single class of students brings a wide array of innate abilities and personal attributes to the formal educational process. These attributes mix with an equally diverse set of teacher expectations and behaviors toward individual class members rendering fruitless many attempts at explanation of educational phenomena via the aggregation of group means. Rossmiller (1979, p. 30) concluded, "Students cannot be treated as identical, interchangeable units; they must be viewed as unique individuals."

Resource inputs and resource applications impact on individual students differently. Efforts recently have been undertaken

to correct this deficiency and to overcome many of the problems associated with the use of aggregated data. Summers and Wolfe (1975) used longitudinal data from 1,896 individual students in Philadelphia in an attempt to identify those school resources which helped learning, as well as those that did not make a difference. Their major finding, in direct contrast to the Coleman Report, was that certain school inputs did affect learning as measured by student achievement. Class size and teacher experience contributed significantly to achievement gains. Certain resources seemed to have greater impact on some students than on others, leading to the proposition that compensatory education, heavily attacked by some, may prove beneficial after all. For example, small classes helped low achievers, but did not particularly aid middle or high achievers. In elementary schools, high achievers performed best with experienced teachers while low achievers gained most with newer, inexperienced teachers. Although the many other findings of this study are important, the most relevant factor to the present study was the ability of the researchers to trace the impact of resource applications to individual students.

Murnane (1975) conducted two studies using individual students in large cities as the unit of analysis. In his first study, he found that the differences in cognitive learning which occur within the same school are at least as significant as the differences found when comparing schools. In the second study (Murnane &

Phillips, 1979), the way in which the teacher organized the classroom and developed classroom climate proved to be predictive of student achievement. Elementary students from low socioeconomic homes responded best to teachers who established a businesslike atmosphere in the classroom and used a large degree of direct instruction (structured curriculum, maximum time usage in actual learning tasks).

The encouraging results of these studies have inspired the use of individual students as the unit of analysis in recent research efforts, including that reported herein. In this way, the impact of differential resource applications can be measured at the most appropriate level.

Time as an Educational Resource

With few exceptions, the variable of student time has largely been neglected in educational research (Thomas, Kemmerer, & Monk, 1978; Frohreich, 1978; Guthrie & Thomas, 1973). Time sometimes has been viewed as an input into the process of education, but, more appropriately, it should be seen as a resource application (Rossmiller, 1979).

Early attempts by educators and economists to account for differences in student achievement were usually efforts to ascertain the number of dollars spent in alternative methods of education. In addition to the problems of aggregated data mentioned earlier, it also became evident that concepts of resource

utilization needed to be altered and broadened to obtain a true picture, not only of the resource allocation to each student, but also the allocation by each student. The concept of foregone income long had been accepted by human capital theorists in assessing the investments wage earners make when opting for a period of education rather than a period of earnings. Becker (1965), an economist, was among the first to recognize that time played an important role in the analysis of educational "expenditures." This idea, however, has not been extended to young, elementary children under the auspices of compulsory education laws. Theoreticians lately have realized that although there may be little foregone income the time allocations exhibited by individual students represent a valid method for examining individual resource allocations. A choice by a student to work on mathematics excludes that student from working on reading. Or, a student playing at recess is foregoing those minutes which could theoretically be applied to study. The state, school, and teacher also make time allocation decisions for the students. The length of school year, length of school day, amount of time accorded each curricular area, and amount of time given to different modes of instruction are all decisions made by others which impinge on an individual student's use of time.

The incorporation of student time utilization into a model of learning began with Carroll's (1963) model of school learning. He claimed that the success which a student experiences in learning

is a function of the extent to which the student spends the amount of time needed to learn the material. His model included five factors, three which are determinants of the time needed for learning and two which determine the time spent in learning. Time needed in learning, Carroll hypothesized, is determined by an individual's aptitude (the amount of time needed to learn a particular task), his or her ability to understand instruction, and the quality of the instruction. Time spent in learning is a function of the time allowed for learning ("opportunity") and the time the individual is willing to spend on learning ("perseverance").

Carroll noted that aptitude, ability to understand instruction and perseverance are all factors which lie within an individual student, while opportunity and quality of instruction are externally determined conditions. Aptitude, opportunity, and perseverance, furthermore, are all quantities expressible in units of time. The degree of learning, then, becomes the ratio of the time actually spent to the time needed. If these quantities are equal, learning is complete. However, as aptitude, opportunity and/or perseverance decrease, the degree of learning decreases also. Although aptitude is generally considered as unalterable, researchers can hope to improve the other four factors. A further implication of Carroll's model is that with all other factors equal, then the degree of learning will be a simple function of the student's perseverance or time on task.

Harnischfeger and Wiley (1976, p. 13) were clearly influenced by Carroll's work when they stated, "The total amount of active learning time on a particular instructional topic is the most important determinant of the pupil's achievement on that topic." Active learning time is influenced not only by the actual amount of time in school, but also by the extent of involvement of the student in the learning activities. In addition, the time spent in school is divided among many curricular areas.

The active learning time of a student in a particular curricular area is related closely to the total amount of content the student comprehends. The amount of comprehended content, however, is influenced by the student's aptitude and prior achievements, the teacher's skill at presentation and instruction, and the nature of the instructional materials. The concept of active learning time is thus traceable through content comprehended to achievement.

Bennett (1978) modified the Harnischfeger-Wiley model and added a feedback dimension (see Figure 1.2). This incorporates the ideas of reinforcement and correction of student work in learning. Bennett said that although the entire model has intuitive and some empirical support, more research is clearly needed, especially with a wide assortment of students.

In the study reported herein, the researcher undertakes an examination of the allocated time (opportunity) and time on task

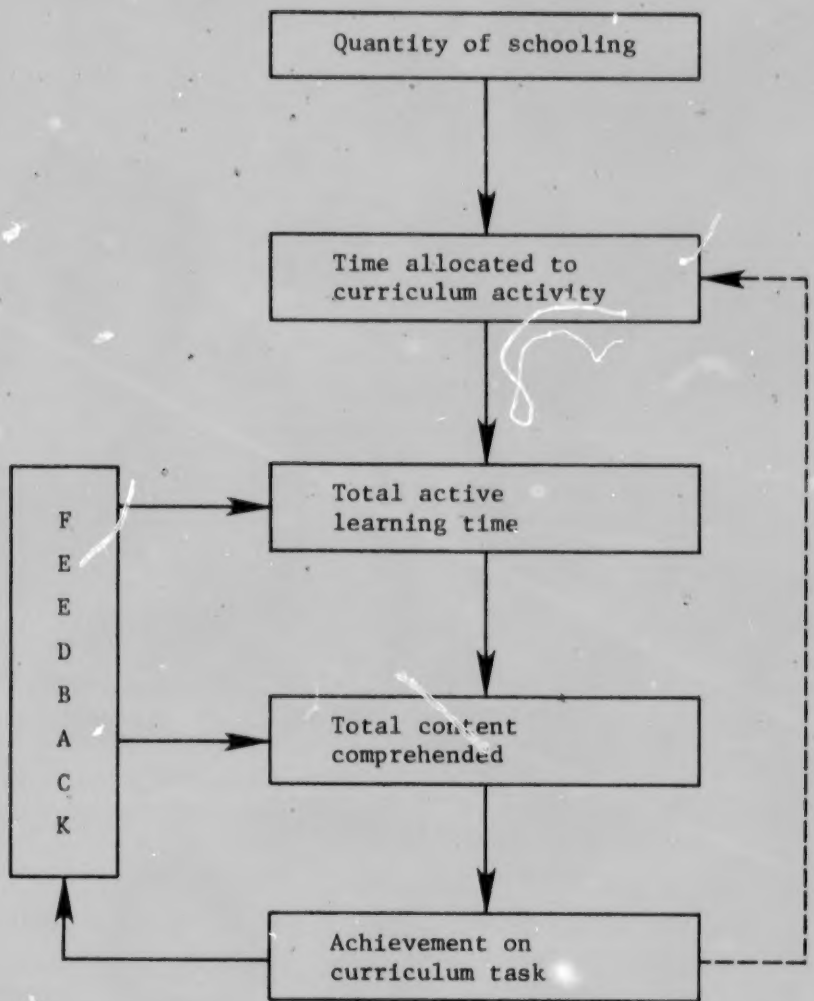

Figure 1.2. Model Relating Pupil Activities to Achievement.

Source: Bennett, N. Recent research on teaching: A dream, a belief, and a model. Journal of Education, 1978, 160(3), 8.

(perseverance or active learning time) dimensions of this model. It also examines some of the relationships between teacher time and learning. Two important advances were incorporated in the present research in that wide varieties of students were carefully observed and each individual was considered separately for many of the analyses.

The following sections will deal with research which has been done on each of three aspects of time allocation: allocated time, time on task, and teacher time.

Allocated Time

Allocated time (alternately called "opportunity to learn" or "elapsed time") is used to describe the amount of time allowed for learning. Kemmerer (1978-79) pointed out that decisions affecting the allocation of student time are made on many levels. State and local officials determine such items as length of school year, length of school day, and amount of time allocated to differing curricular areas. In addition, there are often district policies governing homework, visitors, non-normal interruptions of the school day, and scheduling which further determine time allocation. Classroom teachers subsequently decide how the days, weeks, and months will be subdivided into individual content areas, how individuals in the classes will be grouped, and what percentage of class time will be devoted to academic pursuits. Furthermore, students and their parents have input into the time allocation

process via their decisions regarding enrollment, attendance, homework, and continuance beyond the legal minimum age of schooling.

Wiley and Harnischfeger (1974) studied the quantity of schooling available to individual students in the United States. They found that states varied from a low of 172.6 days per year in Vermont to a high of 182.7 days per year in Maryland. This represented a difference of approximately 6 percent in the number of school days available to students from these states.

Including average daily attendance figures widens the potential gap in exposure to schooling. Wiley and Harnischfeger (1974) calculated that Iowa students (180-day school year, 94.5 percent average daily attendance) were exposed to 16.4 percent more schooling than neighboring Missouri students (174-day school year, 84.0 percent average daily attendance).

In addition to length of school year and attendance variation, Stallings (1975) found that the length of day in the nation's schools varied by as much as two hours.

Wiley and Harnischfeger reanalyzed the Coleman data from Detroit to quantify exposure to schooling by schools. The total number of hours of schooling per year was calculated by multiplying a school's average daily attendance by the number of hours in the school day by the number of days in a school year. Schools from this one area ranged from 710 to 1,150 hours (a 50 percent difference) in the exposure to schooling of their students. One

can surmise that the variations across the nation would prove to be even greater.

There are also wide variations in the amount of time allocated to different curricular areas. This phenomenon was first studied by Mann (1928). In his survey of 444 third grades he derived mean subject area time allocations per day as follows:

Subject	Minutes
Reading	70.4
Language	62.8
Social Studies and Science	31.8
Arithmetic	39.2
General	7.4
Arts	33.4
Nonacademic	24.0
Physical Education and Recess	38.0

More interesting were his findings that some schools allotted 12 times as much time to reading as others and about four times as much to mathematics.

Several recent studies lend credence to Mann's data. The Beginning Teacher Evaluation Study (Fisher et al., 1978) collected data on second and fifth grade classrooms in California. In a class level analysis, the average amount of time allocated to mathematics in the second grade varied from 25 minutes per day to 60 minutes per day. In the fifth grade, reading-related instruction ranged from 60 minutes per day to 140 minutes per day. In addition, teachers allocated different amounts of instruction within these subject areas to the development of particular skills (e.g., reading comprehension versus word usage versus listening skills).

Garner (1978a) and Rossmiller (1978) reported similar results. Garner, in a survey of 74 classrooms of one district, said,

> It is immediately apparent that while the schools do not differ significantly in average time allocations, there is considerable variation among individual teachers at every grade level. For example, the ratio of maximum to minimum reported mathematics time in class ranges from 2.4 to 1 to 4.0 to 1. For language arts the span is 2.3 to 3.5 to 1. In other words, depending on class placement, one child in a given grade may receive from two to four times as much math or language arts class time as another (p. 11).

In data from 82 teachers in 28 schools of a nationwide sample, Rossmiller reported a range of from 2.25 to 10.00 in hours per week of instruction in reading. In mathematics, the results were just as revealing (1.00 to 8.00 hours per week).

The relationship between allocated time and subsequent student achievement has proven difficult to measure. The small amount of research which has been done is fraught with methodological difficulties. One problem has been the use of average time allocation and achievement data aggregated at district, school, or classroom levels. Variations in individual time allocation and achievement wash out and statistical significance is difficult to attain. Another major problem is the reliance on teacher-reported data. When a teacher reports spending one hour per day on mathematics, there is no certainty that students actually spend that hour on mathematics. The relationship of teacher time allocation through student time allocation to student achievement is hazy, at best.

Of the studies to date, that by Wiley and Harnischfeger (1974) has generated the most interest. They concluded,

> In schools where students receive 24 percent more schooling, they will increase their average gain in reading comprehension by two-thirds and their gains in mathematics and verbal skills by more than one-third (p. 9).

However, Karweit (1976), in a replication of Wiley and Harnischfeger's analysis with similar data sources, found much smaller regression coefficients. This position was abetted by Husen (1972) who concluded after a review of research that increasing the amount of schooling may or may not increase achievement. His claim was that the relationship between quantity of schooling and achievement may be curvilinear. In the Rossmiller (1978) study, a set of 12 time allocation variables accounted for only 44 percent of the variance in reading achievement and 38 percent of the variance in mathematics achievement.

Some qualified support for Wiley and Harnischfeger's findings came from Fisher et al. (1979). Their research showed that teachers who allocate more time to particular content areas positively influence their students' achievement scores. Their figures were based on observational data which are much more exact than those provided by previous studies.

The review of literature on allocated time provides much evidence that there indeed are wide variations between schools and classrooms. The relationship to student achievement is cloudy, at

best. The need exists for observational data on the allocated time of individual students in the same classrooms, as well as in different classrooms.

Time On Task

The description of student time on task ("engaged time," "attention to task," or "perseverance") and its relationship to academic achievement has recently appeared in the literature. Time on task is defined as that time when the student is actively attending to the learning task. Theoretically, it can be no greater than allocated time. In fact, it is usually measured as a percentage of the total allocated time. Intuitively, time on task should have a closer relationship to student achievement than does allocated time. This has been borne out by the studies which have been done to date. The studies reported herein have different methodologies which affect their results, but as a whole, they infer that the time on task-achievement link is a most promising focus for research.

Bloom (1974) reported on several research efforts at the University of Chicago concerning student learning time. It was found that students were on task an average of 65 percent of the time. This average, however, varied from 50 percent to over 90 percent for individual students. Anderson (1973) reported that time on task percentages vary by the abilities of the students, with higher ability students spending a larger share of allocated

time on task than did lower ability students. This finding was confirmed by Good and Beckerman (1978). Furthermore, these studies concluded that time on task accounted for approximately 60 percent of the variance in student achievement.

Thomas, Kemmerer, and Monk (1978-79) reported on research they currently are conducting on 248 fifth grade students in 31 classrooms stratified according to socioeconomic levels and district expenditure levels. Preliminary analysis of classroom observation data showed that individual time on task within classrooms is negatively related to students' socioeconomic status, positively related to amount of parental assistance, and positively related to amount of time spent in large-group or whole-class activities. At the same time, among-classroom analyses showed that students in classes with high mean socioeconomic status, relatively high reading comprehension scores, or large amounts of time spent on small group or individual instruction tended to spend more time on task.

Roecks (1977) conducted a small scale study using 36 fifth grade students in two Madison, Wisconsin, elementary schools to study how students of differing achievement levels used their classroom time in an individualized mathematics program. The study had several limitations (small sample, short time period [four months], and limited observations), but the findings were nevertheless quite interesting. He found that the amount of student time on task was directly related to his or her level of achievement.

Furthermore, teachers were able to budget more time for high and low achieving students than they were for medium achievers.

The Beginning Teacher Evaluation Study (Filby & Marliave, 1977; Fisher, Filby, & Marliave, 1977) reported an average engagement rate of 70 to 78 percent for second and fifth grade classrooms in reading and mathematics with a range of 50 to 90 percent over a 7-day period. Within-class variations in time on task were even greater (20 percent to 100 percent).

Several researchers (Brophy & Evertson, 1976; Gump, 1967; Grannis, 1978) have commented on the amount of allocated time spent on noninstructional activities, such as passing out papers, correcting papers, and waiting for the teacher before proceeding. Gump found 12 to 16 percent of class time was so used; Grannis reported a somewhat lower 9 to 13 percent.

Another group of researchers have used observational data to determine the relationship between behavior indicating attention and achievement of individual pupils. Lahaderne (1968) collected data on 125 sixth graders and found correlations of .37 to .53 between "attentive behavior" and achievement. Conversely, Morsh (1956) found a -.58 correlation between achievement and behavior indicating inattention. Cobb (1972) obtained correlations of .40 to .47 between attending and achievement and stated that attending was the most powerful behavioral category for predicting achievement. Other researchers have shown that first grade girls tend to

be more attentive than boys (Samuels & Turnure, 1974), behavior and achievement exhibit a stable relationship across academic settings (Soli & Devine, 1976), and behaviors observed early in an academic year can successfully predict later academic achievement (McKinney, et al., 1975).

The foregoing research leads to the conclusion that time on task may indeed have a positive relationship to student achievement. At least two researchers, however, have sounded a note of warning, hypothesizing that this relationship may not be of a strictly linear nature. Brown and Saks (1978) suggested that the relationship may be governed by a law of diminishing returns (see Figure 1.3). As time on task increases, achievement also increases but the rate of increase tapers off.

Again, observational data based on individual students should increase the capabilities to describe properly and test the relationship of time on task to achievement.

Teacher Time

The concept of teacher time has not been widely nor systematically studied. The idea is based on the intuitive argument that students who work more closely with a teacher will not only have a higher percentage of time on task, but also will display greater achievement gains. Teachers have always made this basic claim, i.e., that small class sizes will yield better educational outcomes, but most studies done to date have simply looked at average

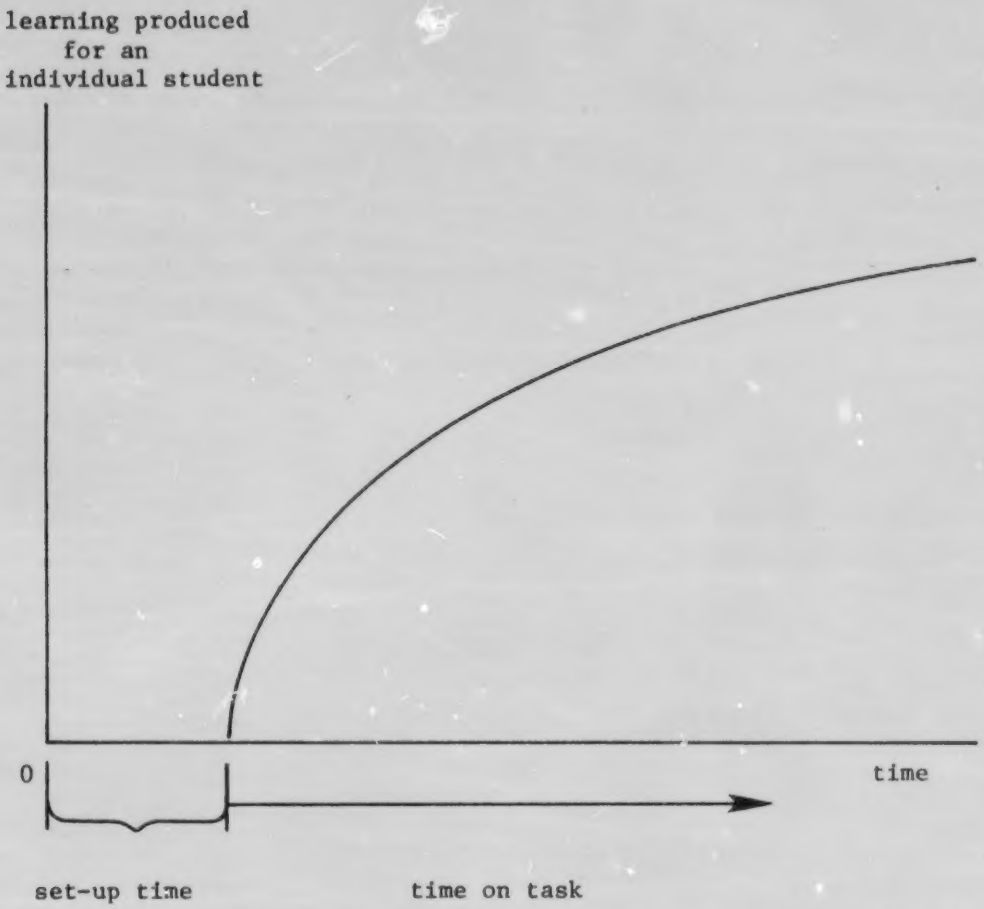

Figure 1.3. Hypothetical Relationship Between Time and Learning for an Individual Student.

Source: Brown, B. W., & Saks, D. H. An econometric perspective on classroom reading instruction. The Institute for Research on Teaching, Michigan State University, Research Series No. 22, July, 1978.

class size and attempted to make inferences from average class scores. An effort needs to be made to trace not only how a district or school utilizes its teaching staff, but also how teachers allocate their most controllable educational resource, classroom time.

Teachers are constantly faced with choices of whom to spend time on, what group sizes to work with, and how to best use their own time. For years, researchers have attempted to derive relationships between the teachers' use of time and several classroom outcomes (for recent examples, see Fisher et al., 1978; Rossmiller, 1978). It is apparent, however, that the variables which influence student outcomes are not necessarily related directly to the teachers' decisions but are more immediately part of the impact of these decisions on particular students. That is, instead of using time spent by the teacher from the standpoint of the teacher, the classroom unit must be broken down into individuals and then time spent by the teacher must be studied from the standpoint of the student. Decisions regarding time utilization which the teacher makes affect each student in a unique way. The study of the relationships between teacher time, time on task, and student achievement therefore must be based on how the teachers' time decisions work to determine each individual's success.

In the Harnischfeger-Wiley (1976) model of the teaching-learning process, the time a student spends with a teacher in a learning situation is divided into three categories: whole-class

time, teacher-supervised subgroup time, and teacher-supervised individual time. There are also unsupervised subgroup time, unsupervised individual time, and out-of-school time, but they are not related to the expenditure of a teacher's time resources.

Studies indicate that there are significant differences in the ways teachers allocate their time to students. Good and Beckerman (1978), in an entirely descriptive study, examined three classrooms in each of two schools. Based on observational data, they found, "Pupil's involvement is highest when they are in a small group or a large group with a teacher" (p. 195). They also observed, however, that students worked privately 51 percent of the day. There were large differences in the percentages of time students were on task in each instructional setting between schools and classrooms. In one class, the students were involved in whole-class instruction 1.6 percent of the time while another classroom tallied 29.3 percent. There were no data on educational outcomes, so there were no inferences possible as to the consequences of these discrepancies on student achievement.

Other studies have supported the assertions that student involvement increases when working with an adult (Filby & Marliave, 1977; Fisher, Filby, & Marliave, 1977); involvement increases as the size of the teacher-supervised group decreases (Gump, 1967); and that there are large differences in the amounts of teacher time received by individual students (Barr & Dreeben, 1977). There also

were some data suggesting that high-ability students are capable of obtaining up to one-third more of the teacher's time than the teacher originally had planned to spend with them (McDermott, 1977).

A few studies have provided evidence of the effects of teacher time on individual student achievement. Soar (1973) found a significant positive correlation between the amount of adult supervision and achievement. Stallings and Kaskowitz (1974) found that teachers spending large quantities of time working with small groups or large groups consistently obtained higher student achievement, while teachers spending more time with one or two students produced lower achievement. This suggests that the teacher may have been aiding those few individuals while the rest of the class floundered. As stated previously, if the allocation of teacher time varies by students within a classroom, both the allocation and the achievement must be measured at the individual level.

Summary

In summary, the review of the literature makes it evident that the study of student time usage is a promising area for investigation. Several expectations for this research study are apparent:

1. Allocated time should be positively correlated with student achievement, but the strength of the relationship may be small.

2. Time on task will exhibit a somewhat stronger correlation with student achievement than will allocated time.
3. The relationship of teacher time to achievement can be expected to be positive. The tie, however, may not be direct, but may include time on task as an intervening variable.
4. It is difficult to assess the impact of using the individual student as the unit of analysis. Although this may provide a more accurate picture than past efforts, not enough studies have been so designed as to warrant any conclusive predictions.

Definition of Terms

This research has been designed to provide evidence of the relationships mentioned in the review of literature. Researchers have used an assortment of terms in describing many of the relevant concepts. For the purposes of this study, the following concepts and terms are central:

1. Individual student time allocation--the activities in which a singular student is engaged measured according to the amount of time the student apportions to each activity.
2. Allocated time--the total amount of in-school time available for a student to learn. Allocated time includes all classroom time whether the student is on task or not on task.

3. Quality of time--measures which increase the value of time available to a particular student. Two quality measures are used in this research: time on task and teacher time.
4. Time on task--the amount of time in which a student is actively engaged in learning at school. It includes the sum of time spent in each of the following categories: independent work, one-to-one instruction, small-group instruction, large-group instruction, and working with other students.
5. Teacher time--a quality of time measure which assigns a higher value to time in which a student is more closely involved with a teacher. For example, a minute a student spends with a teacher in one-to-one instruction may be assumed to be more valuable to that student than a minute spent in large-group instruction with 25 students and one teacher.
6. Reading and mathematics achievement gains--achievement in these two subject areas as measured by standardized tests with the change from the baseline year score to the end of the experimental year score being the gain for each individual student.
7. Independent work--student is reading, studying, writing, working with learning aid, etc., alone.
8. One-to-one instruction--student is working with teacher, aide, or volunteer with no other students.
9. Small-group instruction--student is working with adult and a group of students which is smaller than the full sized class.

10. Large-group instruction--student is working with teacher and other students in work group consisting of all class members.
11. With-students instruction--student is working with another student (or students), but not with an adult.
12. Process behavior--student is waiting for teacher before proceeding, getting directions, correcting tests, etc.
13. Not-on-task behavior--student is resting, staring, wandering around, leaving room for purposes which were clearly non-instructional (sharpening pencils, etc.).
14. Nonobservable behavior--student has left room or is not able to be seen by observer.

Questions and Hypotheses

Through the review of literature several guides for this research were identified. Specifically, this research study was aimed to provide answers to the following broad questions:

A. Do students who spend more time in reading and mathematics classes exhibit greater gains in reading and mathematics achievement than students who spend less time?

B. Does the "quality" of the time which a student spends on a subject have an effect on achievement gains?

The first question was answered by testing the following hypothesis:

A1. The total number of minutes a student spends in reading and mathematics instruction has no significant relationship with that student's gains in reading and mathematics achievement scores.

Answers to the second question were sought by testing the following two hypotheses:

B1. The total number of minutes a student is on task in reading and mathematics has no significant relationship with that student's gains in reading and mathematics achievement scores.

B2. The total amount of teacher time which a student receives in reading and mathematics has no significant relationship with that student's gains in reading and mathematics scores.

An ancillary question which provided a focus for further inquiry was:

C. Are there school and/or background variables which significantly relate to the student time allocation measures?

Organization of the Study

This first chapter has included an introduction to the study, a discussion of the theoretical background of the study, a statement of the problem to be investigated, definitions of

concepts and terms, and an identification of the questions and hypotheses addressed by the study. Chapter II will detail the design and methodology employed in the study, including explanations of the instrumentation, data collection, and data analysis procedures. In Chapter II, the data are presented and analyzed. The final chapter summarizes the results of the study with findings, conclusions, and implications for practice and research.

CHAPTER II

DESIGN AND METHODOLOGY

This chapter describes the research design and methodology utilized in this study. It is comprised of the following sections: the research design, the sample and population, a description of the instrumentation, the data collection procedures, the time allocation variables, and the data analysis procedures.

Design of the Study

This study was designed as part of the Resource Utilization Project undertaken at the Wisconsin Research and Development Center for Individualized Schooling. Data for the study were collected during the 1979-80 school year and were of two types, student achievement gains and student time allocations. The study utilized a pretest-posttest design with the student time allocation data being collected during the interim between tests.

Previous research conducted at the Center relied on the use of teacher-reported data concerning teacher and student time allocation (Rossmiller, 1978). At that time it became apparent that independent observers would provide more accurate data on time allocation. It also appeared that in order to tie time usage measures directly to student achievement, gains as measured by the changes between pretest and posttest scores would be more valid

than a single achievement test score. Using this approach, one need not assume that a student's study habits have been consistent since birth. Attention need only be centered on the student's behavior during the period circumscribed by the pretest and posttest dates. The changes in achievement exhibited by the student will be a product of that measured time period.

As previously stated, this research used the individual student as the unit of analysis for all statistical procedures. In this way a pitfall common to many studies of the effects of schooling was avoided--that is, the dilution of variance due to the aggregation of scores.

Population and Sample

The sample for this study was comprised of 200 third grade students enrolled in three Wisconsin elementary schools. The schools were selected with several considerations in mind:

1. They should be located in areas of differing demography.
2. They should, in some manner, purport to individualize education for each student.
3. They should be willing to enter into a long-term research relationship with the Wisconsin Research and Development Center.
4. The students enrolled in the school should be representative of a typical population of Wisconsin elementary students.

Each of the schools involved in the study regrouped third grade students for instruction in both reading and mathematics according to subject matter ability. All third graders enrolled in the schools were included as part of the sample. Data concerning students for whom parental consent to participate in the study was not granted were restricted to classroom observation data. Data concerning some of the sample students also were limited by the unavailability of baseline achievement test scores.

A short summary of pertinent characteristics of each school is shown in Table 2.1. In addition, it should be noted that instruction at School 3 took place in a large open area with classrooms separated only by temporary movable barriers such as chalkboards, bookshelves, curtains, and portable walls. In Schools 1 and 2, the classroom arrangements were more traditional with the students and teacher of each class interacting in completely separate rooms.

School 1 was one of 18 elementary schools in a community of approximately 50,000 persons. It was located at the far north end of the district. All students attending School 1 walked or had a short bus ride to and from school each day. The attendance area was largely residential, although there were scattered commercial areas. The residents were generally of lower middle-class status with a mixture of occupational types.

School 2 was one of two elementary schools serving a small community of 3,000 in a largely rural area. The students lived in

TABLE 2.1

CHARACTERISTICS OF SAMPLE SCHOOLS

	School 1	School 2	School 3
Approximate population of surrounding community	50,000	3,000	50,000
Approximate enrollment in elementary school	650	470	500
Total sample size (N - 200)	74	56	70
Number of students with available baseline test data (166)	59	49	58
Number of third grade classrooms	3	2	3
Number of student days in 1979-80 school year	176	180	178

town near the school or were bused from some distance. While many parents were involved in agriculture, others found employment in industries located in a city some ten miles away. Most of the parents were blue collar workers; many had ties to the automotive industry.

School 3 was part of a school district located adjacent to a city of 50,000. The school was built to serve the needs of a rather large, rapidly growing area. Students walked or were bused from

the area around the school. The parents primarily had professional occupations and the houses were distinctly middle class. Many parents held management positions in one of several industries in the neighboring city.

Student descriptive statistics for each of the schools, as well as the entire sample, are given in Table 2.2.

TABLE 2.2

STUDENT DESCRIPTIVE STATISTICS

		Sex		Age in Months	IQ
	N	M	F	Mean (S.D.) Range	Mean (S.D.) Range
School 1	74	36	38	102.23 (4.32) 94-116	115.95 (14.40) 88-147
School 2	56	31	25	100.89 (5.02) 93-114	***
School 3	70	36	34	102.70 (4.91) 95-116	115.18 (11.58) 87-145
Totals	200	103	97	101.96 (4.77) 93-116	115.44 (13.11) 87-147

*** IQ scores not available at School 2.

The results of this research may be generalized, with caution, to a population of third grade students in Wisconsin school districts of similar background and demographic characteristics as these three school districts. The focus of the study, however, was the individual student, and it should be noted that each individual is unique in many respects. Research can, at best, only propose tentative explanations regarding individual student behavior.

Instrumentation

During the 1978-79 school year, this researcher and several others associated with the Resource Utilization Project designed and pilot tested several instruments for use in this and companion studies. Two instruments were used in this study: the Student Time Allocation Form and the Classroom Observation Form. A discussion of those instruments and the instruments used to measure outcomes of schooling follows.

Student Time-Allocation Form

The Student Time Allocation Form, included as Appendix A, was developed to provide a general guide to student time allocation for school-related activities during a typical week. It was completed by the teachers. The classes which the students were scheduled to attend, as well as the teachers and aides with whom they worked, were specified. The time block information permitted calculation of the number of minutes each student was scheduled to

be instructed in reading and mathematics (as well as other subject areas) during a typical week of school. In addition to providing a basis for the calculation of student time allocations, the form also served as a timetable for the classroom observations conducted during the year.

Classroom Observation Form

The Classroom Observation Form was designed to provide precise in-class time allocation data on individual students. It is included as Appendix B. After an extensive review of existing classroom observation instruments, the project staff developed an instrument compatible with the needs of this study.

The form was designed so five students could be observed simultaneously by one observer. Student use of time was assigned to one of eight behavioral categories: independent study, one-to-one instruction, small-group instruction, large-group instruction, studying with other students, process behavior, not-on-task behavior, or non-observable behavior. Additional information could be collected concerning the class size, the number of adults present, the subject matter, the name of the teacher, the time of the class, the date of the observation, and the name of the observer. Observers also noted the size of the small group when a student was involved in such a group. Each of the five students was observed at two-minute intervals and his or her behavior was classified according to the eight behavioral categories. By noting the precise

start and stop times for each class, the researchers modified information gathered from the teacher-reported Student Time Allocation Form to provide more accurate data on the actual length of normal class periods.

Other advantages provided by the Classroom Observation Form included the capability to observe more than one student at a time, the ability to distinguish between on-task and off-task behaviors, the capacity to differentiate among various instructional arrangements, and the adaptability of the instrument to different classroom environments.

Interobserver reliability for this instrument was achieved during pilot testing by the Resource Utilization Project staff. After an initial testing and training period, interobserver reliability was calculated by the percentage agreement method. Percentages between pairs of observers for different subjects ranged from 76 percent to 100 percent with a mean of 90 percent.

Standardized Reading and Mathematics Achievement Tests

Achievement gains for individual students were measured by changes in scores on standardized achievement tests. For each student, the researcher collected scores on a baseline test administered by the school district previous to the observation year. At the end of the observation year, the Stanford Achievement Test was administered to each student. The Stanford Achievement Test

(Harcourt, Brace, Jovanovich, 1973) is a series of tests which measure the students' achievement levels in several subject areas. For the purposes of this study, the reading and mathematics components were administered. The reading score was obtained from two subtests: reading comprehension and work study skills. The mathematics score was based on the results of three subtests: mathematics concepts, mathematics computation, and mathematics applications. Form A of Primary Level III, which is appropriate for use with third grade students, was used in this study.

Data Collection

Principals and staff members of the schools involved in the study were contacted in the summer and early fall of 1979. A roster of third grade students was obtained from each school and parental consent forms guaranteeing anonymity of participants were mailed to the parents of each child (see Appendix C). The school principal and the third grade teachers were also asked to sign consent forms (see Appendix D).

Each third grade teacher provided the research team with a schedule of the students' typical week. This information was transferred to the Student Time Allocation Form. Additional data on the daily schedules of those students who received special instruction were obtained in consultation with the student's homeroom and special teachers. In this manner, a precise weekly schedule for each student was determined.

The past achievement test scores in reading and mathematics were obtained from the students' personal files kept at each school.

A team of four researchers visited each school periodically throughout the 1979-80 school year to conduct in-class observations. Using the Classroom Observation Form, the researchers observed at intervals during the year each student for a total of three complete days. If a student was non-observable during a large portion of class time--e.g., became ill, was excused for out-of-school appointments, etc.--another day of observation was obtained for that student.

The research team returned to each school in late April to administer the Stanford Achievement Test. At this time, data concerning individual pupil absences were obtained from central office personnel and data concerning length of school year and number of dismissal days were obtained from the principal. Each school had completed more than 80 percent of its scheduled number of school days by late April. Since each of the schools had not yet completed the full school year, the individual student attendance rates were prorated to the total number of days.

The Stanford Achievement Tests were hand scored by the project staff. Achievement gains for both reading and mathematics were calculated for each student using scaled score norms provided by the publisher. Scaled score norms are a system of inter-battery standard scores which allow for the translation of raw scores at

various levels of the test to a single, continuous scale. They provide approximately equal units; i.e., a difference of ten points in scaled scores between two students' results represents a ten-point difference wherever it occurred on the scale. All levels of the test were converted to this common scale. Because the scale scores are comparable from grade to grade, they are best suited to the measurement of academic growth over a period of time.

Achievement gains were calculated by subtracting the baseline test score from the results of the posttest and dividing by the number of school months which had elapsed between test dates. Each gain score represents a yearly change in scaled score points for an individual student.

Description of Time Variables

The calculation of several time allocation variables was necessary in order to test the hypotheses presented in Chapter I. The methods used in calculating each of the time variables--allocated time, time on task, and teacher time--were important and are described here.

Allocated Time

The first step in the calculation of allocated time in reading and mathematics (ATR and ATM) was to utilize information from the Student Time Allocation Form provided by each student's teachers. From this form, student scheduled time in reading and

mathematics as reported by teachers could be determined. The average number of minutes per day scheduled for reading and mathematics instruction was calculated. If students received extra help in either subject area this fact was reflected in their time figures. Table 2.3 contains information regarding the number of minutes per week students in each of the schools were scheduled to be involved in reading and mathematics instruction.

TABLE 2.3

MINUTES PER WEEK OF STUDENT SCHEDULED TIME IN READING AND MATHEMATICS

	Reading	Mathematics
School 1	370	320 (495*)
School 2	375	275
School 3	565**	300

*Ten students at School 1 had an extra 35 minutes per day of mathematics instruction.

**This figure for School 3 is somewhat inflated as spelling and other language instruction were included as part of a Reading Block.

The second step in the calculation of ATR and ATM was to correct the average scheduled times using the observational data on time usage collected over the course of the year. The average lengths of observed classes in which a student participated were substituted for the teacher-reported scheduled lengths resulting in an actual number of minutes per day.

Finally, to obtain yearly time figures, the number of days present (days in school year minus absences) was multiplied by the observed class length figures. This resulted in the ATR and ATM data for each student.

Time on Task

Time on task was defined in this study as the amount of time in which a student was actively engaged in learning at school. Operationally, it included the sum of time spent by the student in each of the first five observational categories. Categories six (process behavior) and seven (not on task behavior) were not included as part of time on task. Category eight (non-observable behavior) was excluded from all analyses as data concerning whether or not this time was spent in any particular way was neither available nor verifiable.

After the allocated time variables had been calculated, the specifying of the time on task in reading (TOTR) and time on task in mathematics (TOTM) was a two-step process. First, the observational data on each student were used to arrive at percentages of

time spent in each of the first seven observational categories. Percentages of time on task in reading and mathematics (TR% and TM%) were derived by combining the percentages of time spent in observational categories one through five.

Second, multiplying the allocated time for each student (ATR and ATM) by his or her respective time on task percentages (TR% and TM%) gave total number of time on task minutes (TOTR and TOTM).

Teacher Time

Previous data on student use of teacher time are sketchy. Because of the lack of research in this area, there were no existing parameters to guide the calculation of a teacher time variable. The exploratory research described here proposed three alternative methods for the calculation of a teacher time variable. The utility of each of them in predicting achievement outcomes was tested. Each of the three methods used observational categories two (one-to-one instruction), three (small-group instruction), and four (large-group instruction) as bases for the accumulation of teacher time.

In the first method, teacher time in each subject was calculated by summing the percentages of time spent in categories two, three, and four. This percentage was then multiplied by the allocated time to achieve a number of minutes of teacher contact time (TTR1 and TTM1).

The second and third methods involved the use of weighting systems which put heavier emphasis on the size of the group in which the teacher and student were working. In each case, the smaller the work group, then the higher the value of the teacher's time to the student. In the second method, all time in which the student was involved in one-to-one instruction was weighted by a factor of 3; time spent in small-group instruction was weighted by a factor of 2; and, large-group instruction was weighted by a factor of 1. The assignment of weights was arbitrary, although based on the assumption that more direct contact with the teacher was beneficial in promoting achievement. In this way, the teacher time variables (TTR2 and TTM2) reflected a bias toward close teacher-student interaction.

The third method placed an even greater emphasis on one-to-one and small-group instruction. While all one-to-one instruction was weighted by a factor of 1, small-group and large-group instruction were weighted by a factor of 1/n, where n was the size of the work group. For large-group instructional time, n was set equal to the class size. For small-group instruction, the observers kept a record of the number of students in the group and n was assigned that value. Teacher time calculated in this way (TTR3 and TTM3) was the summation of the minutes of teacher-led instruction multiplied by the reciprocal of the work group sizes.

Data Analysis

Data analysis included first a close inspection of the time allocation measures. Analysis of variance and t-test comparisons were utilized to determine whether student background variables had an effect on the time allocation measures. Possibilities of systematic discrepancies in time allocation were examined in this way. One-way analysis of variance tests were performed on the descriptive data.

Ability levels in reading and mathematics were two of the background variables collected for each student. The students were assigned to either a high-, medium-, or low-ability level according to their placement by the schools. Table 2.4 details the assignment plans for both reading and mathematics. The percentages of level placement were not consistent because of uneven groupings by the school.

To test the hypotheses proposed, Pearson Product-Moment correlations were calculated. T-tests were used to test these correlations for statistical significance. Correlations between the allocated time measures and achievement gains were used to test Hypothesis A1. Correlations between the time-on-task measures and achievement gains were used to test Hypothesis B1. Correlations between each of the teacher time variables and achievement gains were used in testing Hypothesis B2 and in evaluating the three methods used to compute a teacher time measure. Several analyses

TABLE 2.4

ASSIGNMENT OF SAMPLE STUDENTS TO ABILITY LEVELS

	School 1	School 2	School 3	Total
Reading				
High	33	16	19	68
Medium	21	23	23	67
Low	20	17	28	65
				200
Mathematics				
High	31	31	29	91
Medium	27	16	24	67
Low	16	9	17	42
				200

were also performed on data for each school and on data for each ability level in order to draw within-school conclusions and within-ability level conclusions.

CHAPTER III

PRESENTATION AND ANALYSIS OF THE DATA

The data are presented and the results of the analysis are reported in this chapter. The chapter is divided into two parts. In the first part, the data are presented and analyzed in a descriptive manner. The second part reports the results of the statistical analyses used in testing the hypotheses.

Description of the Data

In this section, the data are presented descriptively to facilitate examining trends and refining perceptions of the allocation of time resources in the three schools. The data were divided into five categories for descriptive purposes: average class length, allocated time, time on task, teacher time, and achievement gains.

Most of the descriptive data were calculated using the entire sample of 200 students. After close inspection, the investigator decided that it would be advisable to exclude special students--i.e., students receiving additional resources other than those received by most students--from some analyses. Their time allocation measures were generally large, as will be seen, and tended to distort the data in unusual ways. The analyses (excluding special students) were performed on 181 students in reading and 186 students in mathematics.

Tables for all one-way analyses of variance are presented in Appendix G. T-test comparisons between groups are included in the chapter. Statistical tests presented in this chapter were deemed significant if the probability levels associated with the test values were less than .05.

Average Class Length

The amount of time actually provided for instruction in reading and mathematics in the three schools varied. The variance was only partially due to the differences in scheduled time, as was pointed out in Table 2.3. Several other factors also served to alter individual class length, e.g., special assemblies, transition time, planned or unplanned occurrences, etc. These factors, in combination with scheduling decisions made by teachers and administrators, determined the actual length of reading and mathematics classes.

Table 3.1 contains the average class length in reading, by teacher, as well as schoolwide averages. Table 3.2 contains the same information for mathematics classes. There were obvious differences both between schools and within schools. School 1 had a larger commitment of time to mathematics than to reading, whereas School 2 and School 3 had longer reading classes. Overall, the data show that reading received approximately 25 percent more attention in terms of time than did mathematics.

TABLE 3.1

AVERAGE READING CLASS LENGTH IN MINUTES/DAY
BY TEACHER AND BY SCHOOL

	Teacher	N	Class Length	F-Ratio (Sig.)
School 1	11	10	52.3	
	12	32	57.4	
	13	22	61.6	
	17*	5	51.0	
	18*	5	53.0	
Totals		74	57.2	
School 2	21	19	66.3	By School
	22	28	75.9	F = 91.14
	27*	9	65.3	(.0000)
Totals		56	71.0	
School 3	40	25	62.8	
	41	17	66.0	
	42	8	88.7	
	43	15	67.6	
	44	5	68.5	
Totals		70	67.9	
Grand Total		200	64.8	

*Teachers 17, 18, and 27 represent situations where students receiving special instruction in reading attend classes with more than one teacher.

TABLE 3.2

AVERAGE MATHEMATICS CLASS LENGTH IN MINUTES/DAY
BY TEACHER AND BY SCHOOL

	Teacher	N	Class Length	F-Ratio (Sig.)
School 1	11	27	56.9	
	12	31	61.0	
	13	6	61.0	
	17*	10	89.4	
Totals		74	63.3	
School 2	21	31	45.3	By School
	22	21	44.8	F = 2044.15
	27*	4	42.5	(.0000)
Totals		56	44.9	
School 3	40	24	44.6	
	41	26	45.8	
	42	17	46.8	
	43	1	43.3	
	44	2	40.7	
Totals		70	45.5	
Grand Total		200	51.9	

*Teachers 17 and 27 represent situations where students receiving special instruction in mathematics attend classes with more than one teacher.

T-test comparisons performed on the average class length data (excluding special students) by school are shown in Tables 3.3 and 3.4. It is evident that the three schools allocated significantly different amounts of time for reading instruction, with School 2 providing the most, School 3 next, and School 1 the least. School 2 provided 24 percent more time for reading classes than did School 1.

School 1 offered significantly longer mathematics classes than either School 2 or 3. The difference between mathematics time allocations at Schools 2 and 3 was not significant. The ratio of average mathematics class length between School 1 and School 2 was 1.41:1.

The average class length of those students receiving special instruction was of interest. With the exception of the special mathematics students in School 1, all special students received less time than did their counterparts who remained in regular classes. The loss of time could be partially attributed to the movement of students from the regular classroom to the special classroom and back again. This transition time was not included as instructional time and reduced the amount of time available to these students. Students who received special instruction in reading and/or mathematics at School 1 and School 2 were instructed by more than one teacher per subject area. Teacher numbers 17, 18, and 27 actually represent two or more teachers working daily with groups of special students.

TABLE 3.3

T-TEST COMPARISONS OF READING CLASS LENGTH BETWEEN SCHOOLS

School Number (School Mean)	1 (58.05)	3 (67.97)
3 (67.97)	9.93 10.020* .0000	
2 (72.02)	13.97 12.698* .0000	4.05 3.746* .0002

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.4

T-TEST COMPARISONS OF MATHEMATICS CLASS LENGTH BETWEEN SCHOOLS

School Number (School Mean)	2 (45.10)	3 (45.45)
3 (45.45)	.35 1.358 .1763	
1 (59.27)	14.17 53.611* .0000	13.82 56.436* .0000

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

The notable exception to the shorter average class length for special students was in mathematics at School 1 where special students received more time, on the average, than those involved with regular mathematics instruction. This was due to a difference in the way special instruction was organized. In all other instances, students receiving special instruction were involved in reading and mathematics instruction only during the same time blocks as all other students. In School 1, the ten special students received an extra 35 minutes of instruction in mathematics at a time when other students were scheduled for activities other than mathematics.

In School 3, special instruction in reading and mathematics was conducted in a somewhat erratic manner with very few students. If one of the students required special help to keep pace with the remainder of the class, he or she would either be helped by an aide in class or be pulled out of class for a short period and then quickly reinserted. The majority of their instruction was provided in the regular classroom by the regular teacher. Special help did not alter the average class length of these students.

The differences in average class length within schools were substantial in some instances. Again, these differences may have been due to a variety of circumstances, both within and beyond the control of individual teachers. Since all schools grouped students by ability for both reading and mathematics instruction, different

teachers worked with groups of students who needed differing amounts of organization. The location of classrooms resulted in differences in transition time. Whether the teacher had preparation time immediately prior to the time the class met was another factor.

Some factors which influenced average class length were related to decisions made by teachers. The teacher's choice of subject was important. This is especially evident when viewing the results from School 2 and School 3 in reading. In School 2 the morning was scheduled as a reading block and language arts block, but individual teachers could exercise discretion in switching from one subject to another. At times, the teacher may have chosen to allocate the entire morning to reading instruction, rather than dividing it between reading and language arts. Likewise, at School 3 the teachers could divide a reading/language arts block of 113 minutes a day in any manner they desired. Teachers made these curricular time allocation decisions daily for their students. As one might expect, certain teachers proved more adept than others at quickly organizing the students and getting the class started. All of these factors, in varying degrees, influenced the average class length of students in the sample.

The percentages of scheduled class time which actually were devoted to reading and mathematics instruction for the sample students are shown in Table 3.5. The degree of congruence between scheduled times and observed times also is shown. An interesting

TABLE 3.5

PERCENTAGE OF SCHEDULED CLASS TIME USED IN INSTRUCTION*

	Scheduled Min./Day	Observed Average Class Lengths	Percentage (Obs./Sched.)
Reading			
School 1	74	57.2	77.3
School 2	75	71.0	94.7
School 3	113**	67.9	60.1
Mathematics			
School 1	64 (99***)	59.2 (89.4)	92.5 (90.3)
School 2	55	44.9	81.6
School 3	60	45.5	75.8

* As determined by observation
** Language Arts block
*** Special students

finding highlighted by the data was that the classes held immediately after school commenced in the morning (mathematics at School 1 and reading at School 2) were closer in length to the scheduled time than were those conducted later in the day. Special events were typically scheduled later in the school day and the time needed for them was taken from those subjects scheduled for late morning or afternoon.

Allocated Time

The average class length calculations led directly to the calculation of allocated time in reading (ATR) and allocated time in mathematics (ATM). Allocated time in either subject area was the product of an individual's average class length and the number of days present. The number of days present was influenced not only by student absentee rates, but also by the total number of student days during the school year. Table 3.6 describes the days present variable by school, sex, and reading ability level. Only the by-school differences in average attendance were found to be statistically significant. Average student attendance rates (mean attendance/total days) were computed for each school as follows: School 1, 95.2 percent; School 2, 96.7 percent; and School 3, 96.2 percent.

Table 3.7 shows ATR stratified by school and by reading ability level. An analysis of variance showed that there were significant pairwise differences between all three schools in ATR (see Table 3.8). Students in School 2 not only had longer average reading classes but also had a greater average number of days present. This resulted in a 28.7 percent disparity between the ATR at School 2 compared with School 1. Table 3.9 shows that there was a significant difference in the ATRs of the high reading ability level students (Group 1) and low reading ability level students (Group 3). In fact, as the ability level increased, so did the average ATR.

TABLE 3.6

DAYS PRESENT BY SCHOOL, SEX, AND READING ABILITY LEVEL

	N	Min.	Max.	Mean	S.D.	F-Ratio (sig.)
School 1	64	141.3	176.0	167.6	7.65	F = 14.85* (.0000)
School 2	52	153.8	180.0	174.1	5.30	
School 3	70	155.6	178.0	171.3	4.94	
Boys	91	148.2	180.0	171.4	6.14	F = .98 (.3223)
Girls	95	141.3	180.0	170.2	6.98	
High reading	67	148.2	180.0	170.3	5.88	F = .07 (.9351)
Medium reading	68	141.3	180.0	170.7	7.06	
Low reading	46	143.6	179.4	170.7	6.95	
Totals	186	141.3	180.0	170.8	6.59	

*The means for the analysis of variance by school had differences statistically significant at the .05 level.

TABLE 3.7

ALLOCATED TIME IN READING (ATR) IN MINUTES/YEAR

	N	Mean	S.D.	F-Ratio (Sig.)
By School				
School 1	74	9594.	761.	F = 103.71 (.0000)
School 2	56	12361.	944.	
School 3	70	11640.	1347.	
Totals	200	11085.	1575.	
By Reading Ability Level				
High	67	11453.	2004.	F = 3.10 (.0473)
Medium	68	11243.	1110.	
Low	46	10727.	1273.	

TABLE 3.8

T-TEST COMPARISONS OF ALLOCATED TIME IN READING BETWEEN SCHOOLS

School Number (School Mean)	1 (9724.)	3 (11640.)
3 (11640.)	1916. 10.424* .0000	
2 (12515.)	2791. 13.673* .0000	875. 4.368* .0000

Top figure is mean difference.
Middle fiture is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.9

T-TEST COMPARISONS OF ALLOCATED TIME IN READING BETWEEN READING ABILITY LEVELS

Level (Level Mean)	Low (10727.)	Medium (11243.)
Medium (11243.)	516. 1.759 .0802	
High (11453.)	725. 2.465* .0147	209. .790 .4304

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level

Table 3.10 shows ATM stratified by school and by mathematics ability level. School 1 provided significantly more ATM than School 2 and School 3, even when the special students were not included in the analysis (See Table 3.11). The ATM ratio between School 1 and School 3 was 1.36:1. The differences between ATM's stratified by mathematics ability levels were not significant (see Table 3.12), although again the high-ability group had the greatest ATM.

Time on Task

Time on task in reading (TOTR) and time on task in mathematics (TOTM) were calculated by multiplying the ATR and the ATM by the observed percentages of time on task in the respective subjects (TR% and TM%). These percentages are reported in Tables 3.13 and 3.14 with *t*-test comparisons on the data stratified by school, teacher, sex, and ability level. Prior to their inclusion in the analyses of variance, TR% and TM% were transformed by an angular transformation effective in stabilizing variances of proportion (Winer, 1971). The transformation is given by the formula, $x' = 2 \arcsin\sqrt{x}$, where x is the proportion. As a result, all means and standard deviations reported in the analysis of variance and *t*-test comparisons tables are for the transformed percentages.

The overall data on TR% and TM% show how wide the range in time on task actually was. In reading, the percentages ranged from 40.0 percent to 90.8 percent, a difference of over 50 percent. The

TABLE 3.10

ALLOCATED TIME IN MATHEMATICS (ATM) IN MINUTES/YEAR

	N	Mean	S.D.	F-Ratio (Sig.)
By School				
School 1	74	10621.	1838.	F = 507.21 (.0000)
School 2	56	7823.	248.	
School 3	70	7785.	312.	
Totals	200	8845.	1775.	
By Mathematics Ability Level				
High	91	8682.	1261.	F = 1.40 (.2484)
Medium	67	8403.	912.	
Low	28	8437.	911.	

TABLE 3.11

T-TEST COMPARISONS OF ALLOCATED TIME IN MATHEMATICS
BETWEEN SCHOOLS

School Number (School Mean)	3 (7785.)	2 (7852.)
2 (7852.)	67. .844 .4000	
1 (9938.)	2153. 28.794* .0000	2087. 25.847* .0000

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.12

T-TEST COMPARISONS OF ALLOCATED TIME IN MATHEMATICS
BETWEEN MATHEMATICS ABILITY LEVELS

Level (Level Mean)	Medium (8403.)	Low (8437.)
Low (8437.)	34. .137 .8911	
High (8682.)	279. 1.578 .1163	245. 1.033 .3032

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.

TABLE 3.13

PERCENTAGES OF TIME ON TASK IN READING

By School					
School	Minimum	Maximum	Mean	S.D.	F-Ratio (Sig.)
1	40.4	88.8	76.4	9.1	F = 12.64 (.0000)
2	43.6	85.0	66.4	8.8	
3	40.7	90.8	70.1	10.1	
Totals	40.4	90.8	71.4	10.2	

By Teacher				
Teacher	N	Mean	S.D.	F-Ratio (Sig.)
11	10	74.6	6.4	F = 10.24 (.0000)
12	32	71.4	10.1	
13	22	81.5	4.9	
21	19	72.4	7.6	
22	28	62.9	7.4	
40	25	66.6	6.0	
41	17	75.3	9.5	
42	8	78.4	4.0	
43	15	66.2	13.6	
44	5	67.9	10.7	

By Sex				
Boys	86	70.6	10.5	F = .29 (.5908)
Girls	95	71.5	9.6	

By Reading Ability Level				
High	67	70.1	9.9	F = 4.28 (.0153)
Medium	68	73.6	9.9	
Low	46	68.8	9.7	

TABLE 3.14

PERCENTAGES OF TIME ON TASK IN MATHEMATICS

School	Minimum	Maximum	Mean	S.D.	F-Ratio (Sig.)
By School					
1	40.7	82.4	66.4	9.8	F = 28.74 (.0000)
2	46.9	88.7	71.0	9.6	
3	29.9	90.2	58.6	10.0	
Totals	29.9	90.2	65.0	11.0	
By Teacher					
Teacher	N	Mean	S.D.		F-Ratio (Sig.)
11	27	70.3	9.6		F = 11.97 (.0000)
12	31	59.8	8.2		
13	6	74.7	5.4		
21	31	74.3	8.3		
22	21	68.9	9.0		
40	24	60.1	8.7		
41	26	57.5	8.2		
42	17	56.2	12.1		
By Sex					
Boys	91	63.1	11.1		F = 3.89 (.0501)
Girls	95	66.4	11.1		
By Mathematics Ability Level					
High	91	64.4	11.2		F = 2.42 (.0913)
Medium	67	66.8	10.0		
Low	28	61.3	12.9		

disparity in mathematics was even greater, with percentages ranging from 29.9 to 90.2 percent (over a 60 percent difference). It is important to recall that both process behavior and not-on-task behavior contributed to the off-task time of individual students.

Analyses of TR% and TM% by school (Tables 3.15 and 3.16) show that School 1 had significantly higher time-on-task percentages in reading than either School 2 or School 3. In mathematics, School 2 had significantly higher time-on-task percentages than either School 1 or School 3, and School 1's TOTM% was significantly higher than School 3's.

Analyzing TR% and TM% by teacher is a more difficult process. A total of ten teachers participated in the study: three (#11-13) at School 1, two (#21-22) at School 2, and five (#40-44) at School 3. In reading, teachers 13 and 42 had students who exhibited significantly higher TR%'s than the students of most other teachers (see Table 3.17). (Teacher 13's results were significantly higher than eight of the other nine; teacher 42's results were significantly higher than five of the other nine.) There also were significant differences in TR% by teachers within the same schools. At School 1, teacher 13 had students with significantly higher TR%'s than did teachers 11 and 12. At School 2, teacher 21's students were significantly higher in TR% than teacher 22's students. At School 3, students with teacher 42 were significantly higher in TR% than students with teachers 40, 43, and 44. Teacher 41's students

TABLE 3.15

T-TEST COMPARISONS OF PERCENTAGE OF TIME ON TASK
IN READING BETWEEN SCHOOLS

School Number (School Mean)	2 (1.919)	3 (1.993)
3 (1.993)	.074 1.887 .0608	
1 (2.115)	.196 4.881* .0000	.122 3.364* .0009

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.16

T-TEST COMPARISONS OF PERCENTAGE OF TIME ON TASK
IN MATHEMATICS BETWEEN SCHOOLS

School Number (School Mean)	3 (1.749)	1 (1.896)
1 (1.896)	.147 4.025* .0001	
2 (2.038)	.289 7.480* .0000	.142 3.606* .0004

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.17

T-TEST COMPARISONS OF PERCENTAGE OF TIME ON TASK IN READING

BETWEEN READING TEACHERS

Teacher Number (Mean)	22 (1.835)	43 (1.911)	40 (1.912)	44 (1.943)	12 (2.024)	21 (2.043)	11 (2.090)	41 (2.113)	42 (2.177)
43 (1.911)	.076 1.293 .1976								
40 (1.912)	.077 1.529 .1281	.001 .021 .9833							
44 (1.943)	.108 1.213 .2269	.032 .339 .7353	.031 .343 .7320						
12 (2.024)	.189 3.967* .0001	.113 1.958 .0519	.111 2.269* .0245	.081 .910 .3639					
21 (2.043)	.208 3.798* .0002	.132 2.070* .0399	.130 2.327* .0211	.099 1.075 .2840	.019 .354 .7240				
11 (2.090)	.255 3.768* .0002	.179 2.387* .0181	.178 2.586* .0105	.147 1.460 .1462	.067 .998 .3195	.048 .664 .5078			
41 (2.113)	.279 4.924* .0000	.202 3.106* .0022	.201 3.478* .0006	.170 1.819 .0707	.090 1.625 .1061	.071 1.154 .2502	.023 .316 .7525		
42 (2.177)	.342 4.638* .0000	.266 3.302* .0012	.265 3.542* .0005	.234 2.229* .0271	.153 2.107* .0366	.134 1.713 .0849	.087 .993 .3220	.064 .805 .4218	
13 (2.259)	.424 8.098* .0000	.348 5.654* .0000	.347 6.453* .0000	.316 3.468* .0007	.236 4.624* .0000	.217 3.762* .0002	.169 2.409* .0171	.146 2.455* .0151	.082 1.084 .2798

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

were significantly higher than teacher 40's and teacher 43's students. These data reveal that differences between classrooms within the same school were as great as the differences between schools.

The analyses of data on TM% by teacher are shown in Table 3.18. Teachers 43 and 44 were excluded because they worked with only one and two students, respectively. Among the other teachers, there seems to be a distinct break in the data as students in the mathematics classes of teachers 11, 13, 21, and 22 had significantly greater TM%'s than students in the classes of teachers 12, 40, 41, and 42. As can be seen, the data show some significant differences within the same school. In addition to the differences mentioned, teacher 21's mathematics students had significantly greater TM%'s than did teacher 22's students. Although much of the variance between time-on-task percentages of students associated with individual teachers could be attributed to the task orientation of the students and teachers, other factors may have been involved. Each teacher worked with students at a different ability level and with different learning styles. Once again, the reasons for not-on-task behavior may have been either institutional (process behavior) or personal (off-task).

Certain classroom instructional modes led to different time-on-task rates. For example, students working in small-group instruction tended to remain on task a high percentage of the time.

TABLE 3.18

T-TEST COMPARISONS OF PERCENTAGE OF TIME ON TASK IN MATHEMATICS BETWEEN MATHEMATICS TEACHERS

Teacher Number (Mean)	42 (1.697)	41 (1.724)	12 (1.771)	40 (1.779)	22 (1.965)	11 (1.996)	21 (2.088)
41 (1.724)	.027 .449 .6539						
12 (1.771)	.075 1.273 .2047	.047 .918 .3599					
40 (1.779)	.082 1.332 .1845	.055 .997 .3200	.007 .140 .8885				
22 (1.965)	.268 4.239* .0000	.241 4.236* .0000	.194 3.534* .0005	.186 3.215* .0016			
11 (1.996)	.299 4.973* .0000	.272 5.094* .0000	.224 4.380* .0000	.217 3.983* .0001	.030 .539 .5907		
21 (2.088)	.391 6.671* .0000	.364 7.044* .0000	.316 6.414* .0000	.309 5.852* .0000	.122 2.231* .0270	.092 1.799 .0737	
13 (2.091)	.394 4.274* .0000	.367 4.172* .0000	.319 3.689* .0003	.312 3.521* .0005	.126 1.397 .1642	.095 1.085 .2793	.003 .036 .9711

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

Students working independently at their seats while the teacher instructed a small group displayed a tendency toward lower on-task rates.

In the analyses of TR% and TM% by sex (Tables 3.19 and 3.20), girls were found to have higher time-on-task percentages than boys, but not at a statistically significant level.

Analyses of TR% and TM% by ability level produced very similar results (Tables 3.21 and 3.22). In each instance, medium-ability students had greater percentages of time on task than high-ability students and high-ability students had greater percentages of time on task than low-ability students. The differences in TR% and TM% between medium- and low-ability students were statistically significant, as was the difference in TR% between medium- and high-ability students.

TOTR and TOTM were calculated by multiplying the time-on-task rates by the allocated times resulting in the absolute amounts of time on task in each subject area for the school year (Table 3.23). These figures reflect the quantity of time in which a student was actually involved in instruction during the year. As can be seen from the *t*-test comparisons by school, students in School 1 had significantly less TOTR than did students in Schools 2 and 3 (Table 3.24). This was primarily the result of the low ATR at School 1, as the TR% at School 1 was highest of the three schools.

TABLE 3.19

T-TEST COMPARISON OF PERCENTAGE OF TIME ON TASK IN READING BETWEEEN SEXES

Sex (Mean)	Boys (2.008)
Girls (2.026)	.018 .539 .5908

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.

TABLE 3.20

T-TEST COMPARISON OF PERCENTAGE OF TIME ON TASK IN MATHEMATICS BETWEEN SEXES

Sex (Mean)	Boys (1.845)
Girls (1.914)	.069 1.972 .0501

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.

TABLE 3.21

T-TEST COMPARISONS OF PERCENTAGE OF TIME ON TASK IN READING BETWEEN READING ABILITY LEVELS

Level (Mean)	Low (1.964)	High (1.993)
High (1.993)	.029 .693 .4893	
Medium (2.077)	.113 2.697* .0077	.084 2.220* .0277

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.22

T-TEST COMPARISONS OF PERCENTAGE OF TIME ON TASK IN MATHEMATICS BETWEEN MATHEMATICS ABILITY LEVELS

Level (Mean)	Low (1.805)	High (1.874)
High (1.874)	.069 1.344 .1808	
Medium (1.921)	.117 2.171* .0312	.047 1.231 .2199

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.23

TIME ON TASK IN READING (TOTR) AND MATHEMATICS (TOTM)
IN MINUTES/YEAR

School	N	Mean	S.D.	Minimum	Maximum	F-Ratio (Sig.)
Reading						
1	74	7336.1	1086.5	3439.2	9433.6	F = 8.83 (.0002)
2	56	8171.7	971.1	5414.8	10440.0	
3	70	8191.1	1751.3	4680.8	12687.0	
Totals	200	7869.3	1387.4	3439.2	12687.0	
Mathematics						
1	74	7066.9	1718.7	3912.2	12174.4	F = 92.80 (.0000)
2	56	5556.6	778.7	3489.2	7090.4	
3	70	4558.8	763.1	2329.8	6388.0	
Totals	200	5766.2	1614.7	2329.8	12174.4	

TABLE 3.24

T-TEST COMPARISONS OF TIME ON TASK IN READING
BETWEEN SCHOOLS

School Number (School Mean)	1 (7349.)	3 (8191.)
3 (8191.)	843. 3.559* .0005	
2 (8307.)	958. 3.645* .0004	116. .448 .6544

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.25

T-TEST COMPARISONS OF TIME ON TASK IN MATHEMATICS
BETWEEN SCHOOLS

School Number (School Mean)	3 (4559.)	2 (5659.)
2 (5659.)	1100. 7.243* .0000	
1 (6505.)	1946. 13.565.* .0000	846. 5.464* .0000

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

In mathematics, School 1 students had significantly greater TOTM than did either School 2 or School 3 students. School 2 students had significantly greater TOTM than did School 3 students (Table 3.25).

The ratios of TOTR and TOTM between schools are important as indicators of the disparity in actual learning time. In reading, the ratio of highest to lowest school was 1.12:1, and in mathematics it was 1.43:1. Discrepancies among individual students in the sample had even greater ratios: 3.69:1 in reading and 5:23:1 in mathematics.

Teacher Time

Teacher time reflected the amount of time in which a student was in direct instructional contact with a teacher. It was based on time spent in one-to-one, small-group, and large-group instruction. Teacher time was calculated using three methods for both reading (TTR1, TTR2, and TTR3) and mathematics (TTM1, TTM2, and TTM3). Each method of calculation placed progressively heavier weight on instruction in smaller groups than did the previous method. The means and standard deviations for teacher time in reading are reported in Table 3.26 by school, teacher, and ability levels.

T-test comparisons tables for teacher time in reading are displayed in Tables 3.27 through 3.35. Tables 3.27, 3.28, and 3.29 show the analyses by school; Tables 3.30, 3.31, and 3.32 by teacher; and Tables 3.33, 3.34, and 3.35 by reading ability level.

TABLE 3.26

TEACHER TIME IN READING

By School

School	TTR1 Mean	TTR1 S.D.	TTR2 Mean	TTR2 S.D.	TTR3 Mean	TTR3 S.D.	F-Ratio (Sig.)
1	3100.2	1185.9	5395.2	2275.4	347.3	269.6	For TTR1, F = 2.90 (.0576)
2	3613.2	1342.2	6382.5	3226.7	376.7	233.5	For TTR2, F = 2.06 (.1302)
3	3021.9	1128.9	5849.3	2304.7	307.5	210.2	For TTR3, F = .98 (.3761)
Totals	3216.1	1232.1	5830.6	2602.9	341.6	240.5	

By Teacher

Teacher	TTR1 Mean	TTR1 S.D.	TTR2 Mean	TTR2 S.D.	TTR3 Mean	TTR3 S.D.	F-Ratio (Sig.)
11	4442.0	523.6	8185.0	1076.3	529.7	164.9	For TTR1, F = 9.20 (.0000)
12	2315.0	1160.4	3956.0	2191.3	154.1	90.6	For TTR2, F = 12.40 (.0000)
13	3440.0	863.6	5421.0	1388.8	320.5	124.2	For TTR3, F = 11.77 (.0000)
21	3104.0	630.1	3796.0	1084.2	315.5	185.0	
22	3836.0	1732.3	7592.0	3556.7	316.7	176.6	
40	2226.0	871.0	4446.0	1737.0	175.1	73.1	
41	3369.0	658.0	6316.0	1446.9	270.7	67.4	
42	4524.0	941.3	9134.0	1914.3	426.8	157.9	
43	3356.0	1088.2	6568.0	2184.2	522.3	307.1	
44	2416.0	381.0	3867.0	616.0	259.9	136.0	

By Reading Ability Level

Level	TTR1 Mean	TTR1 S.D.	TTR2 Mean	TTR2 S.D.	TTR3 Mean	TTR3 S.D.	F-Ratio (Sig.)
High	2777.0	1172.0	5081.0	2477.0	215.4	130.9	For TTR1, F = 5.18 (.0065)
Medium	3431.0	1411.0	5913.0	2994.0	297.1	147.2	For TTR2, F = 2.52 (.0834)
Low	3320.0	1056.0	6074.0	2210.0	413.8	254.1	For TTR3, F = 17.40 (.0000)

TABLE 3.27

T-TEST COMPARISONS OF TTR1 BETWEEN SCHOOLS

School Number (School Mean)	3 (3022.)	1 (3034.)
1 (3034.)	12. .055 .9562	
2 (3540.)	519. 2.188* .0299	507. 2.099* .0372

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.28

T-TEST COMPARISONS OF TTR2 BETWEEN SCHOOLS

School Number (School Mean)	1 (5121.)	3 (5849.)
3 (5849.)	729. 1.602 .1109	
2 (6058.)	937. 1.855 .0653	290. .420 .6748

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.

TABLE 3.29

T-TEST COMPARISONS OF TTR3 BETWEEN SCHOOLS

School Number (School Mean)	1 (270.0)	3 (307.5)
3 (307.5)	37.5 1.136 .2573	
2 (316.2)	46.2 1.260 .2095	8.7 .241 .8100

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.

TABLE 3.30

T-TEST COMPARISONS OF TTR1 BETWEEN READING TEACHERS

Teacher Number (Mean)	40 (2226)	12 (2315)	44 (2416)	21 (3104)	43 (3356)	41 (3369)	13 (3440)	22 (3836)	11 (4442)
12 (2315)	89. .311 .7561								
44 (2416)	190. .363 .7167	102. .198 .8436							
21 (3104)	878. 2.699* .0076	790. 2.550* .0117	688. 1.280 .2022						
43 (3356)	1130. 3.236* .0015	1041. 3.112* .0022	940. 1.702 .0906	252. .681 .4965					
41 (3369)	1143. 3.401* .0008	1054. 3.286* .0012	953. 1.752 .0816	265. .742 .4593	13. .035 .9724				
13 (3440)	1214. 3.883* .0001	1125. 3.798* .0002	1023. 1.932 .0551	335. 1.001 .3182	84. .233 .8157	70. .204 .8385			
22 (3836)	1611. 5.474* .0000	1522. 5.490* .0000	1420. 2.736* .0069	732. 2.303* .0225	480. 1.404 .1621	467. 1.421 .1570	397. 1.303 .1944		
11 (4442)	2217. 5.540* .0000	2128. 5.493* .0000	2026. 3.460* .0007	1338. 3.203* .0016	1086. 2.489* .0138	1073. 2.519* .0127	1003. 2.459* .0149	606. 1.539 .1258	
42 (4524)	2298. 5.290* .0000	2209. 5.226* .0000	2107. 3.457* .0007	1419. 3.149* .0019	1168. 2.494* .0136	1154. 2.518* .0127	1084. 2.455* .0151	687. 1.603 .1108	81. .160 .8732

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.11

T-TEST COMPARISONS OF TTR2 BETWEEN READING TEACHERS

Teacher Number (Mean)	21 (3796)	44 (3867)	12 (3956)	40 (4446)	13 (5421)	41 (6316)	43 (6568)	22 (7592)	11 (8185)
44 (3867)	71. .067 .9467								
12 (3956)	160. .261 .7941	89. .087 .9304							
40 (4446)	650. 1.011 .3134	579. .559 .5766	490. .869 .3860						
13 (5421)	1625. 2.457* .0150	1554. 1.485 .1393	1465. 2.505* .0132	975. 1.580 .1160					
41 (6316)	2519. 3.574* .0005	2448. 2.279* .0239	2360. 3.723* .0003	1870. 2.817* .0054	895. 1.312 .1912				
43 (6568)	2772. 3.801* .0002	2701. 2.477* .0142	2612. 3.954* .0001	2122. 3.078* .0024	1147. 1.623 .1065	253. .338 .7360			
22 (7592)	3796. 6.048* .0000	3725. 3.634* .0004	3636. 6.655* .0000	3146. 5.145* .0000	2171. 3.609* .0004	1277. 1.966 .0509	1024. 1.516 .1315		
11 (8185)	4389. 5.320* .0000	4318. 3.734* .0003	4229. 5.528* .0000	3739. 4.733* .0000	2764. 3.432* .0008	1869. 2.222* .0276	1617. 1.876 .0624	593. .762 .4470	
42 (9134)	5338. 5.998* .0000	5267. 4.375* .0000	5178. 6.204* .0000	4688. 5.466* .0000	3713. 4.259* .0000	2818. 3.113* .0022	2566. 2.775* .0061	1542. 1.821 .0703	949. .947 .3448

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.32

T-TEST COMPARISONS OF TTR3 BETWEEN READING TEACHERS

Teacher Number (Mean)	12 (154.1)	40 (175.1)	44 (259.9)	41 (270.7)	21 (315.5)	22 (316.7)	13 (320.5)	42 (426.8)	43 (522.3)
40 (175.1)	21.0 .511 .6100								
44 (259.9)	105.8 1.429 .1549	84.8 1.124 .2626							
41 (270.7)	116.5 2.523* .0126	95.5 1.875* .0499	10.8 .138 .8906						
21 (315.5)	161.3 3.619* .0004	140.3 2.996* .0031	55.6 .719 .4734	44.8 .872 .3844					
22 (316.7)	162.6 4.081* .0004	141.6 3.343* .0010	56.8 .760 .4482	46.0 .872 .3322	1.2 .027 .9789				
13 (320.5)	166.4 3.902* .0004	145.4 3.234* .0015	60.6 .795 .4279	49.8 1.002 .3176	5.0 .104 .9173	3.8 .087 .9311			
42 (426.8)	272.6 4.481* .0000	251.6 4.025* .0001	166.9 1.902 .0589	156.1 2.365* .0191	111.3 1.716 .0881	110.1 1.784 .0762	106.3 1.672 .0963		
43 (522.3)	363.1 7.643* .0000	347.1 6.906* .0000	262.4 3.301* .0012	251.6 4.614* .0000	206.8 3.890* .0001	205.6 4.174* .0000	201.8 3.915* .0001	95.5 1.417 .1582	
11 (529.7)	375.6 6.736* .0000	354.6 8.157* .0000	269.8 3.201* .0016	259.9 4.223* .0000	214.2 3.561* .0005	213.0 3.757* .0002	209.2 3.564* .0005	103.0 1.410 .1603	7.5 .119 .9057

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.33

T-TEST COMPARISONS OF TTR1 BETWEEN READING ABILITY LEVELS

Level (Mean)	High (2777.)	Low (3320.)
Low (3320.)	542. 2.283* .0236	
Medium (3431.)	653. 3.058* .0026	111. .468 .6405

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.34

T-TEST COMPARISONS OF TTR2 BETWEEN READING ABILITY LEVELS

Level (Mean)	High (5081.)	Medium (5913.)
Medium (5913.)	832. 1.842 .0671	
Low (6074.)	993. 1.978* .0495	162. .323 .7474

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.35

T-TEST COMPARISONS OF TTR3 BETWEEN READING ABILITY LEVELS

Level (Mean)	High (215.4)	Medium (297.1)
Medium (297.1)	81.7 2.702* .0076	
Low (413.8)	198.3 5.899* .0000	116.7 3.480* .0006

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

Students at School 2 received significantly more teacher time than did students at Schools 1 and 3 when TTR1, the unweighted summation, was used as the measure of teacher time. For TTR2 and TTR3 these differences began to disappear. Many of the teacher time analyses showed this trend. As the weights assigned to one-to-one and small-group instruction increased, the relative means between groups changed, as did the significance probability. By utilizing larger amounts of time in one-to-one or small-group instruction, the school increased its students' TTR2 and TTR3 amounts.

Teachers displayed a variety of approaches to teacher contact time with some relying solely on large group instruction and others making greater use of small-group or one-to-one instruction (see Tables 3.30, 3.31, and 3.32). Teacher time also was, of necessity, a function of class size and amount of assistance provided by aides. Teachers with small classes began with a greater opportunity for providing students with large amounts of teacher time. Likewise, if an aide or parent volunteer was available to help individual students, the teacher time capacity was essentially doubled during that period of time. The ratio of teacher time averages provided by teacher 11 and teacher 12 and calculated as TTR3 was 3.4:1. Teacher 11 worked with 10 students in reading; teacher 12 had 31 students. This effect was also evident at School 3 where Teacher 43 had the smallest reading class and also had a part-time aide. TTR2 and TTR3 were relatively higher than TTR1 for this teacher.

At School 2, teacher 22's students received significantly more TTR1 and TTR2 than did teacher 21's students, but the differences disappeared with TTR3. Each teacher had 28 students in a reading class. This finding shows that teachers in the same school can and do vary greatly in their classroom operation as teacher 21 placed a much greater emphasis on small-group instruction than did teacher 22.

Certain trends became evident when the teacher time data were stratified by reading ability levels (see Tables 3.33, 3.34, and 3.35). Low-ability students received significantly greater amounts of teacher time than did high-ability students regardless of the method used to calculate teacher time. A large share of this difference was due to the smaller class sizes and large number of aides associated with lower-ability classes. The differences in teacher time were greatest using TTR3 where low-ability students had 92 percent more teacher time than did high-ability students and 39 percent more than did middle-ability students.

Middle-ability level students received significantly greater amounts of teacher time than did high-ability students in two of the three methods. The difference in TTR3 was 33 percent. As the weights increase on one-to-one and small-group instruction, the difference between the teacher time of low-ability students became greater. These trends suggest that low-ability students received more one-to-one and small-group instruction.

The teacher time data for mathematics (Tables 3.36 to 3.45) indicate that School 1, which had significantly greater ATM than the other schools, provided a greater amount of teacher time calculated as TTM1 than did the other schools. School 3 had an extremely low TTM1 average compared to the other schools. This school used independent instruction (with one-to-one help) almost exclusively. Students at Schools 1 and 2 had three to four times the amount of TTM1 than did students at School 3.

As weights were placed on smaller group instruction, TTM2 and TTM3 show that School 1 students were provided with progressively less teacher time than were students in the other schools and that School 3's average improved measurably. School 2 students received significantly greater amounts of TTM2 and TTM3 than did students at School 1 and School 3. School 1, which relied primarily on large group instruction in mathematics, had an average TTM3 37 percent lower than School 2. The average at School 3 was 28 percent lower than at School 2. The heavy reliance of School 3 on one-to-one instruction was demonstrated by the ratios of TTM1 to TTM3 at the three schools. They were 14:1 at School 1, 7:1 at School 2, and 2.5:1 at School 3.

Differences within schools in amounts of teacher time used by mathematics students are shown in Tables 3.40, 3.41, and 3.42. At School 1, students of teacher 12 received significantly less teacher time, as calculated by all three methods, than did students

of teachers 11 and 13. Teacher 22's students had significantly greater amounts of teacher time in mathematics than teacher 21's students. Students of teacher 42 received more teacher time than did students of teachers 40 and 41 when calculated as TTM2 and TTM3. These consistent differences by teacher within schools accentuated the differences in teaching modes as well as in class sizes.

Teacher 42 provided a good example of the effect of one-to-one instruction on the teacher time measures. Students of teacher 42 were taught primarily through independent study with one-to-one help given if they experienced difficulty. The average TTM1 associated with students of Teacher 42 was 487.6 (next to the lowest among all teachers). The average TTM3, however, was 452.44, a drop of only 7 percent and second highest among all teachers.

Tables 3.43, 3.44, and 3.45 display the teacher time in mathematics variables stratified by ability level. As in reading, when teacher time was calculated with heavy weights on small-group instruction (TTM3), low-ability students received significantly more teacher time than did high- or medium-ability students. Calculated using unweighted sums (TTM1), medium-ability students had significantly greater amounts of teacher time. As was the case in reading, low- and middle-ability students generally had more teacher time than did high-ability students.

TABLE 3.36

TEACHER TIME IN MATHEMATICS

By School

School	TTM1 Mean	TTM1 S.D.	TTM2 Mean	TTM2 S.D.	TTM3 Mean	TTM3 S.D.	F-Ratio (Sig.)
1	2801.9	1323.5	3083.7	1463.9	238.5	192.0	For TTM1, F = 113.65 (.0000)
2	2194.6	708.5	3613.8	1991.3	352.8	343.0	For TTM2, F = 59.28 (.0000)
3	534.9	490.4	967.2	747.5	223.3	242.1	For TTM3, F = 3.82 (.0236)
Totals	1838.4	1357.7	2491.4	1837.9	265.2	263.5	

By Teacher

Teacher	TTM1 Mean	TTM1 S.D.	TTM2 Mean	TTM2 S.D.	TTM3 Mean	TTM3 S.D.	F-Ratio (Sig.)
11	3517.3	1079.1	3701.9	1108.7	229.8	106.7	For TTM1, F = 56.17 (.0000)
12	1903.9	715.3	1990.6	736.0	111.4	72.3	For TTM2, F = 56.96 (.0000)
13	3340.4	1790.4	3895.2	1893.3	458.0	218.9	For TTM3, F = 8.29 (.0000)
21	1884.5	473.9	2212.9	999.2	221.3	327.2	
22	2759.2	585.7	5659.7	1215.2	441.0	169.8	
40	535.8	305.9	745.1	476.6	90.4	99.8	
41	383.2	348.7	759.0	681.6	195.2	215.3	
42	487.6	335.3	1343.8	784.0	452.4	284.3	

By Mathematics Ability Level

Level	TTM1 Mean	TTM1 S.D.	TTM2 Mean	TTM2 S.D.	TTM3 Mean	TTM3 S.D.	F-Ratio (Sig.)
High	1470.0	880.3	1728.0	1022.0	176.7	230.1	For TTM1, F = 9.62 (.0001)
Medium	2299.0	1546.7	3172.0	2237.0	231.4	186.0	For TTM2, F = 14.12 (.0000)
Low	1431.0	1485.0	2513.0	1834.0	449.1	240.7	For TTM3, F = 16.91 (.0000)

TABLE 3.37

T-TEST COMPARISONS OF TTM1 BETWEEN SCHOOLS

School Number (School Mean)	3 (534.9)	2 (2237.7)
2 (2237.7)	1702.8 10.576* .0000	
1 (2719.2)	2184.3 14.361* .0000	481.5 2.933* .0038

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.38

T-TEST COMPARISONS OF TTM2 BETWEEN SCHOOLS

School Number (School Mean)	3 (967.2)	1 (2891.1)
1 (2891.1)	1923.9 7.911* .0000	
2 (3604.9)	2637.7 10.246* .0000	713.8 2.719* .0072

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.39

T-TEST COMPARISONS OF TTM3 BETWEEN SCHOOLS

School Number (School Mean)	1 (193.9)	3 (223.2)
3 (223.2)	29.3 .733 .4643	
2 (310.0)	116.1 2.688* .0078	86.8 2.049* .0418

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.40

T-TEST COMPARISONS OF TTM1 BETWEEN MATHEMATICS TEACHERS

Teacher Number (Mean)	41 (383.2)	42 (487.6)	40 (535.8)	21 (1884.5)	12 (1903.9)	22 (2759.2)	13 (3340.4)
42 (487.6)	104.4 .490 .6245						
40 (535.8)	152.6 .790 .4306	48.2 .223 .8238					
21 (1884.5)	1501.3 8.273* .0000	1396.9 6.783* .0000	1348.7 7.269* .0000				
12 (1903.9)	1520.7 8.380* .0000	1416.4 6.877* .0000	1368.1 7.374* .0000	19.4 .112 .9108			
22 (2759.2)	2376.0 11.867* .0000	2271.6 10.203* .0000	2223.4 10.904* .0000	874.7 4.535* .0000	855.3 4.434* .0000		
13 (3340.4)	2957.1 9.568* .0000	2852.8 8.804* .0000	2804.5 9.004* .0000	1455.9 4.783* .0000	1436.4 4.720* .0000	581.2 1.840 .0675	
11 (3517.3)	3134.1 16.715* .0000	3029.8 14.340* .0000	2981.5 15.574* .0000	1632.8 9.090* .0000	1613.4 8.981* .0000	758.1 3.818* .0002	177.0 .575 .5663

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.

*Significant at .05 level.

TABLE 3.41

T-TEST COMPARISONS OF TTM2 BETWEEN MATHEMATICS TEACHERS

Teacher Number (Mean)	40 (90.36)	41 (759.0)	42 (1343.8)	12 (1990.6)	21 (2212.9)	11 (3701.9)	13 (3895.2)
41 (759.0)	13.9 .053 .9579						
42 (1343.8)	598.7 2.030* .0439	584.8 2.015* .0454					
12 (1990.6)	1245.5 4.923* .0000	1231.6 4.977* .0000	646.8 2.303* .0224				
21 (2212.9)	1467.8 5.802* .0000	1453.9 5.876* .0000	869.1 3.095* .0023	222.3 .941 .3482			
11 (3701.9)	2955.8 11.327* .0000	2942.9 11.510* .0000	2358.1 8.158* .0000	1711.3 6.986* .0000	1489.0 6.079* .0000		
13 (3895.2)	3150.1 7.417* .0000	3136.2 7.442* .0000	2551.4 5.774* .0000	1904.6 4.589* .0000	1682.3 4.054* .0001	193.3 .460 .6459	
22 (5659.7)	4914.6 17.676* .0000	4900.6 17.951* .0000	4315.9 14.217* .0000	3669.1 13.952* .0000	3446.7 13.107* .0000	1957.8 7.231* .0000	1764.5 4.097* .0001

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.

*Significant at .05 level.

TABLE 3.42

T-TEST COMPARISONS OF TTM3 BETWEEN MATHEMATICS TEACHERS

Teacher Number (Mean)	40 (90.36)	12 (111.42)	41 (195.22)	21 (221.30)	11 (229.93)	22 (441.01)	42 (452.44)
12 (111.42)	21.06 .384 .7016						
41 (195.22)	104.85 1.836 .0691	83.80 1.562 .1202					
21 (221.30)	130.93 2.387* .0181	109.88 2.144* .0334	26.08 .486 .6275				
11 (229.93)	139.57 2.466* .0146	118.51 2.231* .0269	34.71 .626 .5320	8.63 .163 .8711			
22 (441.01)	350.65 5.816* .0000	329.59 5.780* .0000	245.79 4.152* .0001	219.71 3.853* .0002	211.08 3.595* .0004		
42 (452.44)	362.08 5.661* .0000	341.02 5.600* .0000	257.23 4.087* .0001	231.14 3.796* .0002	222.51 3.562* .0005	11.43 .174 .8623	
13 (457.98)	367.62 3.992* .0001	346.56 3.851* .0002	262.77 2.875* .0045	236.69 2.630* .0093	228.05 2.504* .0132	16.97 .182 .8560	5.54 .058 .9539

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.

*Significant at .05 level.

TABLE 3.43

T-TEST COMPARISONS OF TTM1 BETWEEN MATHEMATICS ABILITY LEVELS

Level (Mean)	Low (1431.)	High (1470.)
High (1470.)	39. .144 .8858	
Medium (2299.)	868. 3.080* .0024	829. 4.113* .0001

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.44

T-TEST COMPARISONS OF TTM2 BETWEEN MATHEMATICS ABILITY LEVELS

Level (Mean)	High (1728.)	Low (2513.)
Low (2513.)	784. 2.163* .0313	
Medium (317..)	1444. 5.346* .0000	660. 1.747 .0822

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.45

T-TEST COMPARISONS OF TTM3 BETWEEN MATHEMATICS ABILITY LEVELS

Level (Mean)	High (176.7)	Medium (231.4)
Medium (231.4)	54.7 1.565 .1192	
Low (449.1)	272.4 5.809* .0000	217.7 4.459* .0000

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

Achievement Gains

The achievement gains in reading (RDGAIN) and mathematics (MTHGAIN) were calculated for each student for whom a baseline score was available. The gain scores are shown in Tables 3.46 and 3.49.

The reading gains exhibited by the entire sample averaged 10.5 scaled score points on the Stanford Achievement Test scale. School 3 students had significantly lower reading gains than either School 1 or School 2 students (see Table 3.47). When analyzed by reading ability level (see Table 3.48), no significant differences in reading gain were found between high, medium, and low reading ability atudents. Although the gain scores of the low-ability group were somewhat higher, they did not have a disproportionate bearing on the distribution of reading achievement scores.

In mathematics, the overall gain in scaled score was 12.1 points. School 1 students had significantly greater gains than students at School 2 and School 3 (see Table 3.50). Students in Schools 2 and 3 did not differ significantly in mathematics gain scores. Table 3.51 shows that mathematics gains, unlike reading gains, were significantly greater for the high-ability students than for the low-ability students. The high-ability level students had 35 percent greater gains than did the low-ability level students. The middle-ability level students exhibited gains which were closer to those of the high-level students than those of the low-level students.

TABLE 3.46

ACHIEVEMENT GAINS IN READING

	Mean	S.D.	F-Ratio (sig.)
By School			
School 1	12.0	8.1	
School 2	11.9	7.2	F = 5.58 (.0046)
School 3	7.7	10.1	
Total	10.5	8.8	
By Reading Ability Level			
High	10.52	10.17	
Medium	10.39	7.65	F = .22 (.8060)
Low	11.58	8.22	

TABLE 3.47

T-TEST COMPARISONS OF READING GAIN BETWEEN SCHOOLS

School Number (School Mean)	3 (7.720)	1 (12.398)
1 (12.398)	4.678 2.870* .0047	
2 (12.683)	4.963 2.823* .0054	.285 .160 .8731

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.48

T-TEST COMPARISONS OF READING GAIN BETWEEN ABILITY LEVELS

Level (Mean)	Medium (10.39)	High (10.52)
High (10.52)	.13 .079 .9374	
Low (11.58)	1.19 .617 .5381	1.06 .562 .5748

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.

TABLE 3.49

ACHIEVEMENT GAINS IN MATHEMATICS

	Mean	S.D.	F-Ratio (sig.)
By School			
School 1	14.7	6.8	
School 2	10.5	6.5	F = 10.38 (.0001)
School 3	10.9	5.0	
Total	12.1	6.4	
By Mathematics Ability Level			
High	12.96	6.83	
Medium	12.42	5.72	F = 2.65 (.0738)
Low	9.6	5.43	

TABLE 3.50

T-TEST COMPARISONS OF MATHEMATICS GAIN
BETWEEN SCHOOLS

School Number (School Mean)	2 (10.41)	3 (10.91)
3 (10.91)	.51 .426 .6707	
1 (15.25)	4.85 4.013* .0001	4.34 3.835* .0002

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

TABLE 3.51

T-TEST COMPARISONS OF MATHEMATICS GAIN
BETWEEN MATHEMATICS ABILITY LEVELS

Level (Mean)	Low (9.610)	Medium (12.418)
Medium (12.418)	2.808 1.825 .0699	
High (12.959)	3.349 2.291* .0233	.541 .488 .6261

Top figure is mean difference.
Middle figure is t-value.
Bottom figure is significance probability.
*Significant at .05 level.

Statistical Analysis of the Hypothesis

This section details the statistical analyses performed to test the hypotheses. Each student in the sample had five time allocation measures for reading (ATR, TOTR, TTR1, TTR2, and TTR3) and five time allocation measures for mathematics (ATM, TOTM, TTM1, TTM2, and TTM3). Gain scores in reading (RDGAIN) and mathematics (MTHGAIN) were available on 165 of the students. The correlations were first performed using these 165 students.

Each hypothesis was tested using the entire data set, as well as the data stratified by school. The data were then reanalyzed using all students with the exclusion of students receiving special instruction. The data were also stratified by ability level to check for trends defined by ability differences.

Hypothesis A1: The total number of minutes a student spends in reading and mathematics instruction has no significant relationship with that student's gains in reading and mathematics achievement scores.

To test Hypothesis A1, correlations were computed between students' ATR and RDGAIN and between students' ATM and MTHGAIN. For reading, the results are given in Table 3.52. The overall correlations were -.059 for all students and -.072 for all non-special students, indicating a slightly negative relationship between ATR and RDGAIN. Neither correlation was statistically

TABLE 3.52

CORRELATIONS BETWEEN RDGAIN AND ATR

	Entire Sample		Excluding Specials		Stratified by Ability		
	r	p	r	p	Level	r	p
School 1	.064	.631	.024	.862	High	-.070	.590
School 2	.043	.770	-.076	.635	Medium	.008	.956
School 3	-.052	.699	-.052	.699	Low	-.191	.230
Totals	-.059	.454	-.072	.376			

significant. The correlations for each school were small and inconsistent in sign. For the data stratified by ability, the correlations were consistently negative, but again very small.

The results for mathematics are shown in Table 3.53. The overall correlations were .163 (all students) and .341 (nonspecials). Each of these correlations was significant at the .05 level. The data stratified by school provided interesting findings. Each school had a negative, though not significant, correlation when all students were included in the sample. The overall correlation, however, was positive and significant. When special students were excluded from the analysis, the correlations of Schools 2 and 3 remained negative, School 1's correlation became positive, and the strength of the overall correlation increased. This was probably due to the fact that the special mathematics students at School 1 had large differences in ATM because of their extra session each day. Their MTHGAIN scores were not correspondingly high.

When the mathematics data were stratified by ability level, all three levels exhibited positive correlations between ATM and MTHGAIN. The relationship was statistically significant and strongest among high-ability students.

Hypothesis B1: The total number of minutes a student is on task in reading and mathematics has no significant relationship with that student's gains in reading and mathematics achievement scores.

TABLE 3.53

CORRELATIONS BETWEEN MTHGAIN AND ATM

	Entire Sample		Excluding Specials		Stratified by Ability		
	r	p	r	p	Level	r	p
School 1	-.200	.128	.157	.256	High	.392	.000*
School 2	-.065	.662	-.079	.604	Medium	.238	.084
School 3	-.030	.823	-.030	.823	Low	.218	.307
Totals	.163	.037*	.341	.000*			

*Significant at .05 level.

To test Hypothesis B1, correlations were computed between students' TOTR and RDGAIN and between students' TOTM and MTHGAIN. Table 3.54 gives the results for reading. The overall correlations were small, negative, and not statistically significant: -.062 for all students and -.069 for all nonspecial students. The correlations for Schools 1 and 3 were small and positive. For School 2, the correlations were negative, larger, and in the case of nonspecial students, statistically significant. Stratified by ability level, the data yielded small correlations, two negative and one positive.

For mathematics, the correlations are shown in Table 3.55. The overall correlations were positive with the .254 for nonspecial students being statistically significant. Though the results by school were not significant, Schools 2 and 3 exhibited consistently positive correlations while School 1's were negative. As with ATM, the correlations exhibited a trend toward more positive results when special students were excluded.

The data stratified by mathematics ability level once again displayed a more stable quality than across-groups correlations. All three correlations were positive with statistical significance achieved among high-ability students.

TABLE 3.54

CORRELATIONS BETWEEN RDGAIN AND TOTR

	Entire Sample		Excluding Specials		Stratified by Ability		
	r	p	r	p	Level	r	p
School 1	.073	.581	.072	.604	High	-.107	.406
School 2	-.265	.066	-.377	.015*	Medium	.049	.723
School 3	.007	.957	.007	.957	Low	-.063	.697
Totals	-.062	.429	-.069	.400			

*Significant at .05 level.

TABLE 3.55

CORRELATIONS BETWEEN MTHGAIN AND TOTM

	Entire Sample		Excluding Specials		Stratified by Ability		
	r	p	r	p	Level	r	p
School 1	-.215	.102	-.022	.874	High	.284	.011*
School 2	.145	.326	.189	.215	Medium	.177	.200
School 3	.225	.089	.225	.089	Low	.258	.223
Totals	.144	.064	.254	.001*			

*Significant at .05 level.

Hypothesis B2: The total amount of teacher time which a student receives in reading and mathematics has no significant relationship with that student's gains in reading and mathematics scores.

Hypothesis B2 was tested by correlating each of the student's reading teacher time measures (TTR1, TTR2, and TTR3) with RDGAIN and the mathematics teacher time measures (TTM1, TTM2, and TTM3) with MTHGAIN. The results for reading are shown in Tables 3.56, 3.57, and 3.58. The overall correlations for each of the teacher time measures were small with none approaching statistical significance.

The data stratified by school yielded some interesting results. For School 1, although the correlations were small, the strength of the relationship weakened as the weights associated with small-group instruction increased. In School 2, four of the six correlations were statistically significant, all with negative relationships. The trend at School 2 is also a consistent weakening in the strength of the correlations as the weights were increased. (Although both School 1 and School 2 experienced weaker correlations from TTR1 to TTR2 to TTR3, they were in opposite absolute directions; i.e., School 1 correlations approached zero from a positive direction, while School 2 correlations approached from a negative direction.) The correlations at School 3, like School 1, were small and positive, but exhibited the opposite trend. As the weights assigned to small-group instruction increased, so did the strength of the correlations.

TABLE 3.56

CORRELATIONS BETWEEN RDGAIN AND TTR1

	Entire Sample		Excluding Specials		Stratified by Ability		
	r	p	r	p	Level	r	p
School 1	.100	.453	.139	.315	High	-.069	.595
School 2	-.331	.020*	-.328	.036*	Medium	-.032	.821
School 3	.019	.890	.019	.890	Low	.191	.231
Totals	-.013	.864	.009	.914			

*Significant at .05 level.

TABLE 3.57

CORRELATIONS BETWEEN RDGAIN AND TTR2

	Entire Sample		Excluding Specials		Stratified by Ability		
	r	p	r	p	Level	r	p
School 1	.054	.684	.110	.429	High	-.097	.454
School 2	-.313	.029*	-.288	.068	Medium	-.008	.955
School 3	.069	.610	.069	.610	Low	.073	.650
Totals	-.046	.558	-.022	.791			

*Significant at .05 level.

TABLE 3.58

CORRELATIONS BETWEEN RDGAIN AND TTR3

	Entire Sample		Excluding Specials		Stratified by Ability		
	r	p	r	p	Level	r	p
School 1	-.083	.521	.051	.712	High	-.146	.257
School 2	-.298	.038*	-.223	.160	Medium	.059	.672
School 3	.093	.491	.093	.491	Low	.086	.591
Totals	-.038	.627	.013	.872			

*Significant at .05 level.

The data stratified by ability level showed small correlations, none of which were statistically significant. The trend among high-ability students was toward stronger, more negative results as the weights increased. Among medium-ability students, the trend was in the opposite direction. Among low-ability students, the correlations were all positive, but the trend was inconsistent.

Tables 3.59, 3.60, and 3.61 include the results of the correlations between teacher time measures in mathematics and MTHGAIN. The overall correlations for TTM1 were positive and small, for TTM2 were negative and small, and for TTM3 were negative and statistically significant. The overall trend was toward more negative results as the weights increased on small-group instruction.

This trend was generally consistent for individual schools as well as the total sample. The correlations decreased as the weights increased. Schools 1 and 2 exhibited consistently negative correlations while School 3 correlations became negative.

The results for the data stratified by ability level were much the same: small correlations with a decreasing general trend. The one exception was the correlation of .029 for TTM3 among low-ability students which was an increase over the -.254 for TTM2.

TABLE 3.59

CORRELATIONS BETWEEN MTHGAIN AND TTM1

	Entire Sample		Excluding Specials		Stratified by Ability		
	r	p	r	p	Level	r	p
School 1	-.169	.202	-.121	.382	High	.161	.158
School 2	-.166	.261	-.092	.546	Medium	.206	.136
School 3	.175	.190	.175	.190	Low	-.057	.791
Total	.080	.309	.125	.117			

TABLE 3.60

CORRELATIONS BETWEEN MTHGAIN AND TTM2

	Entire Sample		Excluding Specials		Stratified by Ability		
	r	p	r	p	Level	r	p
School 1	-.214	.104	-.124	.370	High	.035	.759
School 2	-.163	.269	-.122	.424	Medium	.096	.489
School 3	.077	.563	.077	.563	Low	-.254	.231
Totals	-.053	.498	-.014	.859			

TABLE 3.61

CORRELATIONS BETWEEN MTHGAIN AND TTM3

	Entire Sample		Excluding Specials		Stratified by Ability		
	r	p	r	p	Level	r	p
School 1	-.272	.037*	-.117	.400	High	-.206	.069
School 2	-.257	.078	-.253	.093	Medium	-.003	.980
School 3	-.018	.892	-.018	.892	Low	.029	.892
Totals	-.211	.007*	-.175	.028*			

*Significant at .05 level.

CHAPTER IV

SUMMARY, FINDINGS, CONCLUSIONS, AND IMPLICATIONS

This chapter consists of three sections: a summary of the study, findings and conclusions related to the hypotheses investigated, and implications of the findings for practice and future research.

Summary

During the past 20 years, researchers have been concerned with identifying those educational resources which substantially affect student achievement. Many efforts have failed to produce consistent results. Recently, time has attracted attention as a potentially useful tool for accounting for student resource utilization. Personnel of the Resource Utilization Project at the Wisconsin Research and Development Center have undertaken the study of individual student time utilization in the educational process. It has been hypothesized that the ways in which schools and students structure individual student time usage significantly affect the reading and mathematics achievement gains of these students.

In this study, time was viewed both quantitatively and qualitatively. Allocated time was the total amount of in-school learning time available for each individual student. Time on task and teacher time were viewed as qualitative measures of time.

Time on task measured the amount of time a student was actively engaged in the learning process. Three measures of teacher time served to indicate how closely the student was involved with the teacher during classroom instruction.

The theoretical foundations of the study were traced through literature dealing with general systems theory and time as an educational resource. Based on this review of literature, three hypotheses and one ancillary question were identified and subjected to empirical test:

A1. The total number of minutes a student spends in reading and mathematics instruction has no significant relationship with that student's gains in reading and mathematics scores.

B1. The total number of minutes a student is on task in reading and mathematics has no significant relationship with that student's gains in reading and mathematics achievement scores.

B2. The total amount of teacher time which a student receives in reading and mathematics has no significant relationship with that student's gains in reading and mathematics scores.

C. Are there school and/or background variables which significantly relate to the student time allocation measures?

Data of two types were collected during the course of the 1979-80 school year. Individual student time allocation data were collected using the Student Time Allocation Form and Classroom Observation Form, as well as attendance data gathered from student records. Achievement gains in reading and mathematics were derived from the results of a pretest administered by the schools and a posttest administered by the project researchers.

Observational data were collected on a sample of 200 third grade students in three Wisconsin elementary schools. Researchers visited each school several times during the year to gather data through three observations on each student in reading and mathematics classes. These data were analyzed in terms of allocated time, time on task, and teacher time variables.

One-way analysis of variance procedures and *t*-test comparisons were utilized to determine the relationship of student background characteristics to the time allocation variables. Pearson Product-Moment correlations were calculated to test each of the major hypotheses.

Findings and Conclusions

This section presents the findings of the study related to each of the major time variables and conclusions based on the findings.

Findings Regarding Allocated Time (Hypothesis A1)

In terms of the relationship of background variables to allocated time, there were wide differences in allocated time by school. The wide ranges in average reading class lengths (57.2 minutes to 71.0 minutes) and mathematics class lengths (44.9 minutes to 63.3 minutes) portrayed the varying emphases placed on instruction in particular curricular areas at each school. These differences were the major source of the significant differences in time allocated to both reading and mathematics by school.

These findings supported those of Wiley and Harnischfeger (1974), Garner (1978a), and Rossmiller (1978) insofar as they demonstrated vast differences in the quantity of schooling available to individual students. There were more than 100 percent differences in allocated time in reading (ATR) and allocated time in mathematics (ATM) between the highest and lowest individual students in the sample.

Hypothesis A1 regarding the relationship of allocated time to student achievement gains was rejected for the entire sample in mathematics and for high ability students in mathematics. No other statistically significant correlations were found. The findings indicated that the relationship between allocated time and achievement gains was generally small, particularly in reading. The correlations in mathematics were somewhat higher especially when the data were stratified by ability level.

The findings lend only qualified support to the assertion that high allocated time is a significant aid in student achievement. This appeared to be true only in mathematics. Whereas Wiley and Harnischfeger (1974) demonstrated large increases, the data here showed negative results for reading. Allocated time in mathematics did produce positive gains in student achievement, although the correlation was not large. Overall, major differences in allocated time by curricular area were apparent, but their relationship to achievement gains remains cloudy.

Conclusions Regarding Allocated Time

1. There were significant differences in the amount of time available to individual students in reading and mathematics classes.

2. Allocated time in reading and mathematics varied significantly by school.

3. Students with greater amounts of allocated time exhibited significantly greater achievement gains in mathematics.

Findings Regarding Time On Task (Hypothesis B1)

Study of individual student time on task produced results of interest. Time-on-task rates were examined for different categories of students. Overall, the disparities in percentages of time on task were large. Certain students showed the ability to remain on task 90 percent of the time, while others were as low as

40 percent in reading and 30 percent in mathematics. These variances are even wider than those reported by Bloom (1974) and are similar to those found in the Beginning Teacher Evaluation Study (Filby & Marliave, 1977; Fisher, Filby, & Marliave, 1977). In general, students were more on task in reading (71 percent) than in mathematics (65 percent).

Student time-on-task rates varied by school, by teacher within school, and by ability level. Students with some teachers were found to have average time-on-task rates 15 to 20 percent higher than students with other teachers. There were some differences between the mean time-on-task rates in a teachers' reading and mathematics classrooms, but the teacher with students having the highest time-on-task rates in reading also had students at the top in mathematics. The teacher does have a large effect on the time-on-task rates of students.

As with Anderson (1973) and Good and Beckerman (1978), this study found that higher-ability students were on task more of the time than lower-ability students. This study, however, found that the medium-ability students were significantly more on task than either high- or low-ability students.

Differences by school in allocated time and in percentage of time on task led to significant differences in total amount of actual student learning time at the three schools. Students at School 1 had significantly less actual reading instruction, but

more actual mathematics instruction, than students at either School 2 or School 3.

The differences in time on task were greatest when analyzed at the individual level. Some students had three times as much actual learning time in reading as others. In mathematics, the differences were as great as five to one.

Hypothesis B1 regarding the relationship between time on task and student achievement gains was rejected in the analyses of mathematics for the entire sample excluding special students, for the data on high-ability students in mathematics, and for reading at School 2. In all other cases, the correlations were small and not statistically significant.

These findings showed that time on task had a positive relationship with student mathematics achievement, but in no case was it a strong relationship. Once again, the most startling data regarding time on task focus on the large differences in quantities of time exhibited by individual students.

Conclusions Regarding Time on Task

1. Individual students exhibited wide variations in time-on-task rates in reading and mathematics.

2. Time-on-task rates in reading and mathematics were significantly related to the school the student attended, the teacher the student had, and the ability level of the student.

3. The actual amount of student time on task in reading and mathematics varied considerably between students and was related to the school which the student attended.

4. Nonspecial students with greater amounts of time on task exhibited significantly greater achievement gains in mathematics.

Findings Regarding Teacher Time (Hypothesis B2)

Analysis of the teacher time data yielded several findings of interest. The unweighted amounts of teacher contact time in reading and mathematics (TTR1 and TTM1) were largely a function of the available instructional time, allocated time (ATR and ATM). The school with the greatest amount of allocated time in reading or mathematics also had the greatest amount of teacher time calculated by this method.

The amount of teacher time a student received was influenced by the size of class in which the student was involved. This worked to the advantage of students at the lower ability levels in each of the three schools. In School 1, the lowest reading level class had 20 students and three teachers, while the medium and high levels had 23 and 31 students, respectively, and one teacher each. In School 2, the lowest reading level students worked with two teachers while the higher ability levels worked with one. In School 3, the lowest reading class had only 17 students, whereas the others ranged from 25 to 30 students. These differences led to a large (92 percent) discrepancy in teacher time in reading

calculated the third way (TTR3) between the low- and high-ability level students. The discrepancy in teacher time in mathematics (TTM3) was even greater (154 percent).

The teacher time measures were very sensitive to the organizational patterns of individual classrooms. Those classrooms in which a heavy emphasis was placed on large-group instruction had high teacher times calculated as TTR1 and TTM1. Those classrooms in which the emphasis was on small-group and one-to-one instruction had high teacher times calculated as TTR3 and TTM3. This finding was to be expected, as the weighting systems used to calculate teacher times were designed specifically to highlight these differences. School 3 and teacher 42 provided prime examples of the effect on teacher times of emphasizing one-to-one instruction in mathematics. Calculated as TTM1, School 3 provided an average of less than one-fifth as much teacher time as School 1. Calculated as TTM3, School 3 provided 15 percent more teacher time than School 1. Teacher 42 provided less TTM1 than all but one teacher, but more TTM3 than all but one teacher. Teacher 42's class was of average size--the difference was a heavy emphasis on individualized instruction and one-to-one assistance.

As with allocated time and time on task, the most interesting finding is the wide range of teacher time provided to individual students. Every student in the sample was involved in reading and mathematics classes, but not every student sought and received the

individual attention contributing to teacher time. This does not imply that teachers did not make a sincere attempt to provide teacher time, but some students either were capable of attracting or were in a better position to attract much more teacher time than were others.

Hypothesis B2 regarding the relationships between each of the teacher time measures and achievement gains was rejected for the total sample in the case of TTM3 and mathematics gains. The significant inverse relationship signifies that students receiving large amounts of one-to-one instruction in mathematics exhibited less gain than did other students. Correlations by school and by ability levels were not significant except in School 2 which had significant negative correlations between teacher time measures and achievement gains in reading.

Although most of the correlations in mathematics did not prove to be statistically significant, there was a trend evident in the relationship between the teacher time measures and achievement gains. As the weights increased on one-to-one instruction, the correlations became stronger in a negative direction. This trend indicated that better results in mathematics might be achieved with group rather than one-to-one instruction. An alternative explanation was that lower-ability students tended to have higher teacher times and lower gains, thereby affecting the correlations negatively.

Conclusions Regarding Teacher Time

1. Individual students were provided with significantly different amounts of teacher time in reading and mathematics.

2. The amount of teacher time a student received in reading and mathematics was influenced by the teacher.

3. Lower-ability-level students received significantly more teacher time in reading than either high- or medium-ability-level students. Medium-ability students received more teacher time than high-ability students.

4. The amount of teacher time an individual student received in relation to other students varied by the method chosen in calculating teacher time.

5. Students with greater amounts of weighted teacher time exhibited less achievement gains in mathematics.

6. Mathematics achievement gains were positively related to larger group instruction.

Implications

This section includes implications of the research findings for practice and future research.

Implications for Practice

Several implications for practicing teachers and administrators can be deduced from the data and findings of this research. They are categorized here by implications relating to scheduling

in elementary schools, implications for administrators, and implications for teachers.

The research findings contained several results which related to the scheduling of student time in elementary schools.

1. Teachers, administrators, and school boards should pay close attention to the amount of unused school time (process behavior, transition time, etc.) in relation to the amount of actual instructional time available to students (allocated time). A certain amount of non-instructional time is to be expected in every school day because of recesses, lunch hours, etc. However, there appears to be a great amount of transition time, preparation time, and other forms of process behavior which detract from the amount of actual instructional time. Compounding the problem is the not-on-task time of students in class, which further reduces the time on task. For the students in the sample, the average school day began at 8:45 a.m. and ended at 3:21 p.m. for a total lengh of 6 hours and 36 minutes (396 minutes). Of this total, an average of 250 minutes per day were scheduled into academic classes (approximately 65 percent of the total). Actual instructional time in reading and mathematics classes was generally 80 to 85 percent as much as the schedules indicated and the average time-on-task

percentages were approximately 68 percent. The result is that of the 6 hours and 36 minutes of scheduled school day, only 2 hours and 19 minutes (or approximately 35 percent) represented actual time that a student was on task in an academic subject. When one adds the time spent getting to and from school, the percentage becomes even lower. The "wasted time" percentage could be dealt with in two ways. If the system is satisfied with the total amount of instructional time allocated to students, then it may be possible to reduce the unused time. If, on the other hand, the system determines a need to obtain more instructional time, then the allocated time or time on task or both must be increased.

2. Teacher choice of subject is an important determinant of the amount of time any student receives in a particular curricular area. Elementary teachers usually have preferences for one subject relative to another and these preferences obviously affected the time data. If a teacher is interested in an area and confident in his or her subject matter expertise, then there is a tendency to spend more time on that subject. This implies that closer inspection of the original time schedules and adherence to curricular time allocations should be observed to attain the desired emphases. It also

implies that elementary teachers might be rotated among classes to teach in their areas of expertise. Some of this was already evident at the schools in the sample.

3. Those subjects which are scheduled for the early morning are less likely to be interrupted and more likely to last the entire scheduled length. Schools should schedule the subjects upon which the most importance is placed immediately in the morning. Classes held later tended to be cut short or eliminated by special events. The classes conducted first in the morning were, on average, over 90 percent of the scheduled time, whereas other classes averaged between 60 and 82 percent of the scheduled time.

4. The treatment of special students in terms of their receipt of time resources should be examined carefully by each school. With one exception, all special students in the sample actually received less allocated time than did other students. This was generally because of the transition time necessary to move between the regular classroom and the special classroom. The trade-off was for smaller group size. Only in School 1 in mathematics did special students receive more instruction, and there it was at the expense of another curricular area. Special help does not necessarily translate into additional time allocation.

Two other implications for practicing administrators were evident.

1. As has often been suggested, it is imperative to match teaching styles with learning styles to most effectively use time resources. The abilities of some students to work best with a teacher that uses one-to-one and independent instruction may be offset by other students who learn more efficiently in a large-group situation. The study of student learning styles must be matched with an appraisal of effective teaching strategies in order to maximize learning.
2. The use of a classroom observation form similar to that used in this study would be beneficial to administrators. It allows the quantification of student time into descriptive categories which can serve to provide effective feedback to teachers and parents. Easily attainable would be percentages of on-task time, off-task time, process behavior time, and time in each size of instructional group.

Three implications have particular relevance for teachers in terms of classroom management and instructional style.

1. Increased time on task should yield greater achievement gains. This seems to be particularly true in mathematics. Much of the task orientation of students relates

directly to the task orientation of teachers. Classes that were highly organized seemed to have students who were more on task. Much off-task behavior resulted from students not knowing what they were expected to do or not having anything to do when they were finished with a particular task. Those teachers with readily available learning activities had more on-task students (often without having to redirect them).

2. In mathematics, large-group instruction produced greater gains in achievement than did individual work mixed with one-to-one help. This is consistent with the findings of Stallings and Kaskowitz (1974). The correlations between teacher time and achievement gains were consistently more positive when there were equal weights on large-group, small-group, and one-to-one instruction than when small-group and one-to-one instruction were heavily weighted. This may have been due to the result of the positive interaction between students and teacher in a larger group, and the ability of teachers to better explain concepts to students than can a textbook. With individualized instruction, there seemed to be a tendency to answer the same question over and over to several students rather than once to the entire group. If the objectives were common and the content sequenced, then progress came more quickly in the large group.

3. Contrary to popular opinion, schools and teachers are succeeding in devoting more teacher contact time to lower-ability students. If a goal of educators is to get more help to students with greater needs, then the data suggest that the goal was being accomplished. Most of the increased teacher time was due to smaller class sizes and additional teacher assistance provided by aides, volunteers, and student teachers.

Implications for Future Research

The findings of this study have several implications for future research concerned with the allocation of student time resources.

1. Mathematics seemed to be an easier subject in which to account for student time allocation than was reading. The findings in mathematics were more stable than those in reading. Several problems existed in the study of reading which made reading time more difficult to analyze than mathematics time. First, mathematics classes are quite clearly defined in length while reading classes are often interspersed with language arts and other subjects. It can be argued that reading is learned (if not taught) in all subjects and, therefore, the study of time spent in reading instruction must include an examination of all subjects. Mathematics consists of

several well defined concepts which are taught sequentially and in much the same manner at every school. Such is not the case with reading instruction which has a variety of approaches and, in the elementary school, is more complex than mathematics. Measurement by testing in mathematics is subsequently more straightforward than testing in reading. Gains can often be measured daily in mathematics.

2. Future researchers should attempt to gather longitudinal data on student time allocation and achievement gains. Difficulties associated with testing can be somewhat alleviated in this way. When an achievement gain score depends on one baseline score and a posttest score, any inconsistency in administration or a problem with an individual student on either test date seriously affect the gain score. By taking repeated measures, researchers can gain confidence over time that the measures are reliable. This is also the case with observational data gathered over several years rather than one year. Each year's data will not only add quantity to the number of observations but also will allow for the study of changes as students mature and encounter different teachers and learning environments.

3. The proper unit of analysis for research of this type is the individual student. It allows the researcher to analyze the data on several levels: between schools, within a school, within a classroom, and by any background measure deemed important. The variances associated with individual student time allocations within the same classrooms showed that there were as many differences among students in the same classrooms as there were between classrooms. By analyzing at any higher level of aggregation, the researcher loses these vital distinctions.
4. The study of student time as an educational resource is a promising avenue for further research. The variances associated with allocated time, time on task, and teacher time were large. It would also be advisable to examine student use of time outside of the regular school day, as this time may make an important contribution to student achievement. Time spent doing homework, reading, etc., could enhance the in-school learning time of students.
5. Future research should examine the ways in which teachers use their time outside of class in an attempt to add quality to the in-class time of students. For example, if a teacher has prepared an hour for a class, the time

in class should be worth more to the student than if the teacher has prepared for only 30 minutes.

6. Future research should examine carefully the relationship of ability level to time on task. Why do medium-ability students exhibit more time on task than either high- or low-ability students? Is the instruction geared toward the "middle of the road" students? Are there other intervening variables?
7. Future research should examine the relationship between work group size and on-task behavior. It was apparent to observers that students working in small groups were more on task than were students working in large groups or independently. Is there an optimum class size at which time-on-task behavior is maximized? Does this optimum size differ for different subjects?
8. Additional research is needed on the calculation of the teacher time variable. In terms of predicting mathematics achievement, the unweighted method seems to be the most promising. If, however, the research is most interested in tracing teacher resource usage, then the weighted method is preferable.

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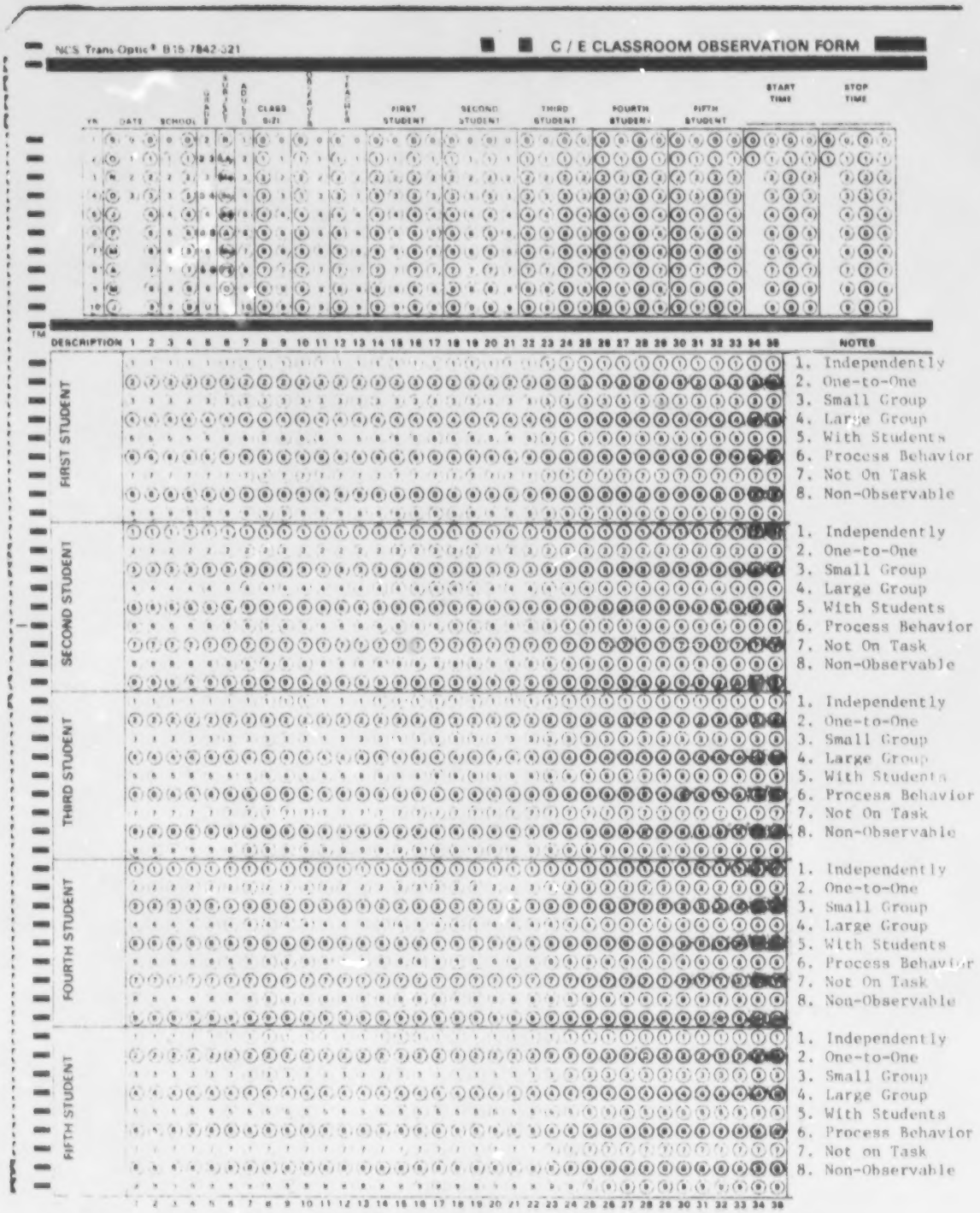
APPENDIX A

STUDENT TIME ALLOCATION FORM

Student Time Allocation Chart

APPENDIX B

CLASSROOM OBSERVATION FORM


NCS Trans Optic® B15 7842 321
C / E CLASSROOM OBSERVATION FORM
YR
DATE
SCHOOL
CLASS SIZE
FIRST STUDENT
SECOND STUDENT
THIRD STUDENT
FOURTH STUDENT
FIFTH STUDENT
START TIME
STOP TIME
DESCRIPTION
NOTES
FIRST STUDENT
SECOND STUDENT
THIRD STUDENT
FOURTH STUDENT
FIFTH STUDENT
1. Independently
2. One-to-One
3. Small Group
4. Large Group
5. With Students
6. Process Behavior
7. Not On Task
8. Non-Observable

APPENDIX C

PARENTAL CONSENT FORM

Student Name: _____

Wisconsin Research and Development Center
for Individualized Schooling

SCHOOL RESOURCE UTILIZATION STUDY

Parental Consent Form

The study in which you and your child are invited and requested to participate is designed to examine the ways in which a variety of resources, such as money and time, are used in the educational process and how various resources affect the progress of individual students. The study will cover a three-year time period. Students who are in the third grade during the 1979-80 school year will be the focus of the study, which will be completed during your child's fifth grade year. In conducting the study, the researchers will observe students in school, review pertinent school records, and interview selected teachers and parents.

All participants will remain anonymous, and no individual or school will be identified in any reports of the research.

Any questions you may have concerning the procedures to be used in the study will be answered. You are free to withdraw your consent and discontinue participation in the study at any time.

Please sign below to indicate your consent to participate in the study and return this form in the enclosed envelope. Thank you for your willingness to participate.

_____ _____
Parent or Guardian Date

APPENDIX D

STAFF CONSENT FORM

School Name _____

RESOURCE UTILIZATION STUDY

Staff Consent Form

The research in which you are asked to participate is designed to study the ways in which a variety of resources are used in the educational process and how they affect individual students. The study will cover a three-year time period beginning with the 1979-80 school year. In conducting the study, the researchers will observe students in school, analyze pertinent school documents, and interview selected teachers, parents, and administrators.

All participants will remain anonymous, and no individuals or school will be identified in any reports of the research.

Any questions you may have concerning the procedures to be used in the study will be answered. You are free to withdraw your consent and discontinue participation in the study at any time.

Please sign below to indicate your consent to participate in the study. Thank you.

_____ _____

Name Date

APPENDIX E

GLOSSARY OF VARIABLES USED IN THE STUDY

GLOSSARY OF VARIABLES USED IN THE STUDY*

Student identification number (ID)
School identification number (SCHOOL)
Student intelligence quotient (IQ)
Sex of student (SEX)
Age of student (AGE)
Reading teacher (RDGTCH)
Mathematics teacher (MTHTCH)
Attendance (DAYSPR)
Baseline score in reading (RDGBEG)
Baseline score in mathematics (MTHBEG)
Posttest score in reading (RDGEND)
Posttest score in mathematics (MTHEND)
Reading gain score (RDGAIN)
Mathematics gain score (MTHGAIN)
Average length of reading class (AVGRDG)
Average length of mathematics class (AVGMTH)
Observed time in reading in independent work (R1)
Observed time in reading in one-to-one instruction (R2)
Observed time in reading in small-group instruction (R3)
Observed time in reading in large-group instruction (R4)
Observed time in reading in with other students instruction (R5)
Observed time in reading in process behavior (R6)
Observed time in reading in not-on-task behavior (R7)
Observed time in reading in non-observable behavior (R8)
Total observed time in reading (RTIME)
Observed time in mathematics in independent work (M1)
Observed time in mathematics in one-to-one instruction (M2)
Observed time in mathematics in small-group instruction (M3)
Observed time in mathematics in large-group instruction (M4)
Observed time in mathematics in with other students instruction (M5)
Observed time in mathematics in process behavior (M6)
Observed time in mathematics in not-on-task behavior (M7)
Observed time in mathematics in non-observable behavior (M8)
Total observed time in mathematics (MTIME)
Percentage of reading time spent in independent work (RP1)
Percentage of reading time spent in one-to-one instruction (RP2)
Percentage of reading time spent in small-group instruction (RP3)
Percentage of reading time spent in large-group instruction (RP4)
Percentage of reading time spent in with other students instruction (RP5)

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*All variables were at an individual student level.

Percentage of reading time spent in process behavior (RP6)
Percentage of reading time spent in not-on-task behavior (RP7)
Percentage of mathematics time spent in independent work (MP1)
Percentage of mathematics time spent in one-to-one instruction (MP2)
Percentage of mathematics time spent in small-group instruction (MP3)
Percentage of mathematics time spent in large-group instruction (MP4)
Percentage of mathematics time spent in with other students instruction (MP5)
Percentage of mathematics time spent in process behavior (MP6)
Percentage of mathematics time spent in not-on-task behavior (MP7)
Allocated time in reading (ATR)
Allocated time in mathematics (ATM)
Percentage of time on task in reading (TR%)
Percentage of time on task in mathematics (TM%)
Time on task in reading (TOTR)
Time on task in mathematics (TOTM)
Teacher time in reading by first method (TTR1)
Teacher time in mathematics by first method (TTM1)
Teacher time in reading by second method (TTR2)
Teacher time in mathematics by second method (TTM2)
Teacher time in reading by third method (TTR3)
Teacher time in mathematics by third method (TTM3)
Reading ability level (RDGLEV)
Mathematics ability level (MTHLEV)

APPENDIX F

PEARSON PRODUCT-MOMENT CORRELATIONS FOR VARIABLES USED IN STUDY

CORRELATION MATRIX PAGE 1
BIVARIATE SUBSAMPLE METHOD FOR MISS. DATA

VARIABLE NO. NO. NAME	2 SCHOOL	3 IQ	4 SEX	5 AGE	6 MDGTCH	7 MTHTCH	10 DAYSPR	11 MDGBEG	12 MTHBEG	13 MDGEND	14 MTHEND	15 MDGAIN
2 SCHOOL	1.000											
3 IQ	-.026	1.000										
4 SEX	-.016	-.105	1.000									
5 AGE	.063	-.209	-.152	1.000								
6 MDGTCH	.990	-.035	-.054	.060	1.000							
7 MTHTCH	.992	-.050	-.041	.067	.991	1.000						
10 DAYSPR	.183	.104	-.089	.011	.195	.189	1.000					
11 MDGBEG	.990	.004	.041	.028	.052	.070	-.273	1.000				
12 MTHBEG	-.047	.061	.010	.033	-.07[illegible]	-.078	-.170	.669	1.000			
13 MDGEND	.053	.072	.194	.019	-.015	.003	-.061	.665	.583	1.000		
14 MTHEND	-.013	.049	.015	.050	-.008	-.[illegible]5	-.027	.574	.671	.807	1.000	
15 MDGAIN	-.221	.118	.097	-.058	-.235	-.[illegible]	.107	-.368	-.080	.382	.177	1.000
16 MTHGAIN	-.218	.105	.020	-.048	-.238	-.[illegible]	-.050	.174	-.146	.395	.512	.300
17 AVGMDG	.467	.123	-.063	.012	.462	.443	.284	-.143	-.090	.025	.101	-.098
18 AVGMTH	-.620	-.148	-.046	.041	-.586	-.588	-.284	.190	.195	-.070	-.057	.046
19 AIM	.484	.106	-.030	.015	.483	.445	.514	-.195	-.124	.009	.085	-.059
20 ATM	-.613	-.115	-.062	.098	-.570	-.551	-.102	.152	.178	-.077	-.057	.070
21 TTM3	-.084	-.304	-.134	.096	.002	-.012	.108	-.405	-.350	-.567	-.476	-.038
22 TTM3	-.058	-.350	-.013	-.014	-.024	.000	.059	-.337	-.302	-.432	-.460	-.062
23 M1	.456	.209	.029	.096	.420	.403	.032	.300	.284	.292	.266	-.085
24 M2	.028	-.195	.001	-.030	.043	.009	.098	-.130	-.152	-.275	-.288	.024
25 M3	.446	-.213	-.086	.170	.401	.404	.111	-.168	-.171	-.155	-.053	-.068
26 M4	-.297	.101	.135	-.142	-.330	-.323	-.119	.040	.049	.083	.064	.080
27 M5	-.158	.127	.076	-.067	-.180	-.172	.158	-.069	-.001	.101	.152	.097
28 M6	.438	-.171	.130	.089	.[illegible]48	.412	.168	.002	-.003	.128	.129	-.012
29 M7	.335	.099	-.136	-.053	.345	.348	.207	-.081	-.132	-.107	-.103	-.139
30 M8	-.040	-.142	-.036	.036	-.044	-.047	.[illegible]32	-.134	-.046	.014	.044	.143
31 MTIME	.543	.047	.006	.103	.528	.516	.231	.044	.059	.137	.185	-.069
32 M1	-.122	-.057	.010	.141	-.096	-.082	-.104	.208	.155	.019	.009	.016
33 M2	.185	-.275	.003	.084	.216	.222	.042	-.173	-.167	-.321	-.347	-.143
34 M3	-.106	-.197	-.040	-.197	-.091	-.077	.273	-.537	-.491	-.399	-.398	.043
35 M4	-.065	-.045	.090	.013	-.069	-.081	-.322	.150	.227	.127	.156	.183
36 M5	.390	.015	.041	.045	.392	.385	.070	.070	.010	.117	.071	.015
37 M6	-.409	.091	.059	.079	-.426	-.416	-.170	.364	.364	.217	.288	.007
38 M7	.389	-.130	-.163	-.089	.408	.415	.005	.074	-.071	-.119	-.222	-.203
39 M8	-.116	-.295	-.045	.228	-.087	-.079	-.017	-.103	-.037	-.163	-.105	-.079
40 MTIME	-.539	-.171	.006	.072	-.511	-.497	-.260	.205	.181	-.046	-.049	.045
41 MP1	.131	.242	.033	.034	.122	.101	-.122	.345	.328	.275	.203	-.042
42 MP2	-.012	-.229	-.020	-.020	-.001	.032	.081	-.135	-.160	-.263	-.281	.023
43 MP3	-.000	-.252	-.129	.131	.045	.035	-.016	-.176	-.201	-.225	-.125	-.053
44 MP4	-.355	.116	.104	-.156	-.394	-.381	-.145	.024	.082	.078	.048	.116
45 MP5	-.227	.116	.117	-.118	-.247	-.239	.129	-.058	-.007	.090	.109	.094
46 MP6	.203	-.237	.185	.031	.195	.182	.065	.001	-.015	.098	.064	.018
47 MP7	.186	.116	-.141	-.065	.202	.208	.163	-.107	-.171	-.159	-.176	-.128

C O R R E L A T I O N S Matrix PAGE 2
MISSING DATA FOR SELECTED RUN - TABLE DATA

VARIABLE NO.	2	3	4	5	6	7	10	11	12	13	14	15
NO.	SCHOOL	ID	SEX	AGE	HDGTCH	MINTCH	DAISPH	HDGBEG	MTHBEG	HDGEND	MTHEND	PDGAIN
48 MP1	.306	.084	.085	.114	.307	.311	.055	.123	.071	.124	.109	-.007
49 MP2	.243	-.223	.001	.044	.472	.274	.076	-.169	-.173	-.324	-.340	-.146
50 MP3	-.043	-.141	-.041	-.220	-.040	-.072	.269	-.534	-.489	-.386	-.382	.044
51 MP4	-.024	-.000	.046	.011	-.693	-.650	-.308	.143	.233	.176	.218	.188
52 MP5	.420	.016	.049	.048	.418	.410	.078	.055	-.007	.108	.052	.008
53 MP6	-.179	.164	.054	.076	-.244	-.206	-.075	.355	.362	.286	.373	-.032
54 MP7	.511	-.100	-.100	-.059	.527	.543	.075	.008	-.130	-.148	-.248	-.211
55 IM1	-.213	.097	.042	.036	-.200	-.218	-.220	.162	.171	.076	.099	.009
56 IM2	-.350	.033	.142	-.080	-.344	-.355	-.020	-.229	-.129	-.037	-.020	.235
63 IM3	.237	.197	.014	.048	.244	.217	.240	-.001	.055	.083	.156	-.062
64 TOT1	-.634	-.094	.035	.045	-.601	-.592	-.089	-.051	.029	-.100	-.079	.193
65 IIM1	-.054	-.100	-.055	.037	-.033	-.039	.119	-.284	-.251	-.255	-.133	-.013
66 IIM1	-.727	-.104	.083	-.100	-.713	-.715	-.120	-.225	-.098	-.160	-.126	.189
67 IIM2	.052	-.100	-.100	.049	.040	[illegible]	.139	-.281	-.274	-.286	-.164	-.046
68 IM2	-.351	-.105	.029	-.131	-.519	[illegible]	.052	-.450	-.395	-.372	-.348	.121

CORRELATION MATRIX PAGE 3 SUBSET 1
BIVARIATE SUBSAMPLE METHOD FOR MISS. DATA

VARIABLE NO. NO. NAME	16 MTHGAIN	17 AVGHDG	18 AVGMTH	19 AIM	20 AIM	21 TIM3	22 TIM3	23 M1	24 M2	25 M3	26 M4	27 M5
16 MTHGAIN	1.000											
17 AVGHDG	-.213	1.000										
18 AVGMTH	.162	-.981	1.000									
19 AIM	-.149	.967	-.967	1.000								
20 AIM	.163	-.933	.982	-.995	1.000							
21 TIM3	-.085	-.044	.304	-.009	.351	1.000						
22 TIM3	-.211	-.055	.079	-.034	.089	.374	1.000					
23 M1	-.100	.239	-.294	.223	-.293	-.381	-.274	1.000				
24 M2	-.048	.054	-.041	.073	-.028	.401	.445	-.125	1.000			
25 M3	.022	.234	-.017	.240	.001	.480	-.034	-.123	-.168	1.000		
26 M4	.051	-.155	-.005	-.166	-.047	-.137	.053	.023	.055	-.508	1.000	
27 M5	.076	.074	-.056	.109	-.030	-.150	-.007	-.104	-.055	-.149	.064	1.000
28 M6	-.056	.169	-.386	.197	-.349	-.238	-.188	.339	-.076	.242	-.151	.065
29 M7	-.134	.309	-.324	.422	-.300	-.062	.020	-.050	.062	.132	-.209	.087
30 M8	.093	.259	-.162	.266	-.145	-.066	-.017	-.145	.043	-.155	.012	.133
31 MITM	-.072	.477	-.488	.491	-.401	-.141	-.205	.629	-.065	.336	-.018	.105
32 M1	.090	-.305	.552	-.303	.557	.178	-.100	-.033	-.093	.132	-.185	-.095
33 M2	-.206	.037	-.071	.039	-.065	.266	.731	-.067	.103	.100	-.043	-.080
34 M3	-.136	.141	-.143	.199	-.103	.217	.470	-.304	.304	-.070	.138	.212
35 M4	.194	-.430	.488	-.462	.445	-.013	-.049	-.121	-.105	-.153	.258	-.055
36 M5	.011	.131	-.235	.130	-.229	-.025	-.144	.096	.050	.043	-.145	-.071
37 M6	.265	-.486	.526	-.487	.517	-.144	-.180	.088	-.049	-.167	.011	.018
38 M7	-.163	.092	-.144	.078	-.146	.015	.076	.038	.046	.078	-.285	-.194
39 M8	-.133	-.026	.241	-.028	.267	.239	.067	-.119	.094	.023	-.011	.035
40 MITM	.154	-.814	.830	-.820	.813	.194	.096	-.180	.012	-.068	-.044	-.120
41 MP1	-.085	-.046	.026	-.077	.042	-.401	-.200	.783	-.094	-.441	.043	-.166
42 MP2	-.050	.021	.004	.041	.015	.401	.479	-.159	.974	.182	.018	-.049
43 MP3	.097	-.023	.247	-.022	.249	.553	.053	-.407	-.158	.880	-.501	-.217
44 MP4	.054	-.192	.033	-.208	.008	-.143	.064	-.044	.049	-.540	.981	.055
45 MP5	.085	-.004	.004	.030	.030	-.131	.005	-.155	-.051	-.219	.069	.967
46 MP6	-.038	-.085	-.173	-.041	-.169	-.240	-.102	-.010	-.048	.069	-.169	.011
47 MP7	-.132	.104	-.203	.207	-.184	-.012	.086	-.249	.108	.019	-.212	.055
48 MP1	.012	.139	-.037	.138	-.023	.006	-.246	.145	-.136	.224	-.190	-.054
49 MP2	-.218	.115	-.190	.116	-.183	.233	.719	-.051	.127	.077	-.065	-.049
50 MP3	-.133	.159	-.196	.219	-.155	.169	.422	-.277	.259	-.092	.170	.227
51 MP4	.191	-.315	.367	-.351	.322	-.087	-.107	-.077	-.127	-.149	.297	-.033
52 MP5	-.021	.156	-.259	.154	-.253	-.017	-.142	.090	.038	.051	-.149	-.079
53 MP6	.219	-.284	.232	-.282	.230	-.208	-.263	.215	-.074	-.135	.013	.085
54 MP7	-.203	.209	-.309	.200	-.307	.017	.078	.054	.054	.107	-.292	-.165
55 TM8	.076	-.235	.318	-.288	.290	.155	-.018	.285	-.088	.059	.225	-.10.
56 TM8	.070	-.024	.106	-.014	.105	.141	.111	-.183	-.021	-.004	.269	.072
63 TOTM	-.118	.612	-.703	.611	-.265	.100	-.050	.445	-.003	.233	.047	-.006
64 TOTM	.144	-.490	.803	-.457	.816	.350	.146	-.330	-.030	.016	.115	.017
65 TTM1	.042	.244	.009	.253	.027	.586	.[illegible]	-.435	.057	.684	.060	-.164

CORRELATION MATRIX PAGE 4
PAIRWISE DELETION OF MISSING DATA

VARIABLE NO. NO.	10 VAR	17 VAR	18 VAR	19 VAR	20 VAR	21 TIME	22 TIME	23 M1	24 M2	25 M3	26 M4	27 M5
08 TIME	.040	-.337	.448	-.515	.438	.192	.317	-.330	.063	-.103	.345	.082
07 TIME	.024	.280	.003	-.278	.032	.037	.151	-.416	.125	.820	-.276	-.185
08 TIME	-.053	-.139	.252	-.119	.205	.301	.592	-.392	.185	-.135	.310	.147

CORRELATIONS - Factor Page 3 SUBSET 1
Bivariate Outputting Options Plus Data

VARIABLE NO. NO.	NAME	Z0 X0	Z1 X1	Z2 X2	Z3 Alias	Z4 Y1	Z5 Y2	Z6 Y3	Z7 Y4	Z8 Y5	Z9 Y6	Z10 Y7	Z11 Y8	Z12 Y9
Z0 X0		1.000												
Z1 X1		.264	1.000											
Z2 X2		-.024	.021	1.000										
Z3 Alias		.043	.435	.044	1.000									
Z4 Y1		-.004	-.130	-.042	-.115	1.000								
Z5 Y2		.011	.134	.021	.038	.035	1.000							
Z6 Y3		-.109	.114	.033	-.135	-.313	.008	1.000						
Z7 Y4		-.457	-.459	-.075	-.535	.014	-.432	-.284	1.000					
Z8 Y5		-.028	-.035	-.048	-.013	-.178	-.132	-.082	-.277	1.000				
Z9 Y6		-.028	-.251	-.204	-.145	.194	-.211	-.248	.389	-.094	1.000			
Z10 Y7		.050	.333	-.017	.246	-.147	.470	-.002	-.428	.103	-.186	1.000		
Z11 Y8		-.043	-.065	.181	-.026	.314	.045	-.033	-.016	-.102	-.048	-.126	1.000	
Z12 Y9		-.430	-.241	-.140	-.188	.544	.004	-.177	.529	-.195	.610	.018	.243	1.000
Z13 XM1		-.242	-.375	-.233	.080	.014	-.102	-.248	.117	.153	.245	-.028	-.078	.103
Z14 XM2		-.124	-.014	-.018	-.108	-.088	.088	.341	-.076	.040	-.022	.045	.103	.071
Z15 XM3		-.058	-.003	-.206	-.148	.440	.077	-.016	.018	.032	-.080	.025	.071	-.016
Z16 XM4		-.207	-.247	.008	-.121	-.173	-.081	.142	.284	-.181	.042	-.292	-.016	.020
Z17 XM5		-.033	.010	.007	-.034	-.004	-.041	.218	-.001	-.074	.058	-.208	.020	-.112
Z18 XM6		.010	.022	-.043	.172	-.021	-.018	-.121	-.078	-.033	.098	.007	-.112	.080
Z19 XM7		.034	.438	.005	.151	-.041	.124	.108	-.398	-.016	-.219	.390	-.080	.060
Z20 XM8		.198	.097	.058	.483	.713	-.005	-.322	-.351	-.069	-.250	-.188	.125	-.033
Z21 XM9		.034	.104	.058	.072	-.042	.470	.101	-.292	-.071	-.277	.251	-.033	-.071
Z22 XM10		-.157	.128	.018	-.104	-.333	.058	.988	-.307	-.056	-.322	-.002	-.071	.002
Z23 XM11		-.211	-.436	-.013	-.409	-.061	-.270	-.322	.969	-.285	.299	-.487	-.003	.003
Z24 XM12		-.043	-.043	-.043	-.011	-.141	-.030	-.031	-.303	.987	-.140	.094	-.108	.108
Z25 XM13		.158	-.141	-.174	.031	-.044	-.245	-.301	.193	-.007	.904	-.221	-.147	.147
Z26 XM14		.111	.430	-.000	.193	-.436	.284	.058	-.549	.180	-.326	.955	-.193	.193
Z27 XM15		-.343	-.715	-.503	-.423	.124	-.107	-.102	.374	.078	.237	-.300	.015	-.015
Z28 XM16		-.217	-.518	-.043	-.141	.241	-.100	.177	.407	-.124	-.298	-.732	.011	-.011
Z29 XM17		-.130	-.413	-.213	-.235	-.131	-.037	.074	-.096	.189	-.194	-.158	-.030	.030
Z30 XM18		-.374	-.540	-.074	-.448	.308	-.043	.026	.567	-.238	.195	-.521	.225	-.225
Z31 XM19		-.138	-.043	-.140	-.026	-.032	.037	.249	.003	-.007	-.249	-.121	.048	-.048
Z32 XM20		-.307	-.471	-.064	-.423	-.177	-.072	.317	.791	-.352	.158	-.429	-.012	.012
Z33 XM21		-.082	-.012	-.150	-.108	.022	.084	.201	-.087	.049	-.240	-.012	.055	-.055
Z34 XM22		-.347	-.141	-.010	-.306	-.473	.197	.068	.394	-.311	-.072	-.267	-.023	.023

CORRELATIONS WITH MP3 FOR MISSING DATA

SUBSET 1

BIVARIATE CORRELATIONS PRINTED FOR MISSING DATA

VARIABLE NO.	40	41	42	43	44	45	46	47	48	49	50	51
NO. NAME	TITE	MP1	MP2	MP3	MP4	MP5	MP6	MP7	MP1	MP2	MP3	MP4
40 TITE	1.000											
41 MP1	.167	1.000										
42 MP2	.058	-.026	1.000									
43 MP3	.153	-.496	-.135	1.000								
44 MP4	-.007	.033	.020	-.449	1.000							
45 MP5	-.051	-.133	-.021	-.258	.072	1.000						
46 MP6	-.043	-.104	-.053	-.014	-.187	-.011	1.000					
47 MP7	-.143	-.410	.083	-.070	-.228	.026	-.055	1.000				
48 MP1	-.106	-.018	-.100	.145	-.208	-.078	.085	.022	1.000			
49 MP2	-.157	-.105	.041	.053	-.007	-.007	-.005	.150	-.022	1.000		
50 MP3	-.237	-.276	.250	-.054	.174	.255	-.131	.179	-.328	-.117	1.000	
51 MP4	.174	.116	-.102	-.017	.315	.006	-.078	-.390	-.316	-.312	-.334	1.000
52 MP5	-.251	.144	.027	.040	-.103	-.081	-.040	-.009	-.054	-.054	-.041	-.307
53 MP6	.243	.249	-.050	-.149	.029	.091	.183	-.181	-.239	-.255	-.305	.181
54 MP7	-.217	-.050	.039	.017	-.304	-.188	.037	.417	-.187	.311	.072	-.385
55 TH5	.287	.314	-.054	.101	.234	-.035	-.368	-.731	-.077	-.143	-.113	.346
56 TT5	.015	-.045	-.015	.045	.271	.038	-.151	-.280	.308	-.106	.174	.452
61 TUTH	-.282	.376	-.004	.108	.019	-.030	-.316	-.417	.054	-.020	.062	-.035
62 TUTT	.020	-.050	.005	.259	.142	.077	-.200	-.297	.163	-.188	-.017	.496
63 TIH1	-.084	-.356	.033	.758	.055	-.145	-.155	-.111	.018	.056	.219	.040
64 TIT1	.381	-.301	.102	.041	.371	.134	-.184	-.276	-.550	-.102	.293	.754
67 TIH2	-.059	-.271	.135	.004	-.485	-.216	-.092	-.027	.065	.077	.163	-.083
68 TIT2	.193	-.220	.215	.058	.333	.180	-.204	-.098	-.537	.192	.681	.350

VARIABLE NO.	52	53	54	55	56	61	62	63	64	67	68
NO. NAME	MP5	MP6	MP7	TH5	TT5	TUTH	TUTT	TIH1	TIT1	TIH2	TIT2
52 MP5	1.000										
53 MP6	-.083	1.000									
54 MP7	.170	-.278	1.000								
55 TH5	.084	.144	-.340	1.000							
56 TT5	-.113	-.431	-.724	.252	1.000						
61 TUTH	.276	-.097	-.044	.541	.183	1.000					
62 TUTT	-.249	-.084	-.031	.301	.033	-.110	1.000				
63 TIH1	.008	-.455	-.084	.243	.208	.341	.177	1.000			
64 TIT1	-.304	-.028	-.501	.321	.524	-.080	.031	.176	1.000		
67 TIH2	.084	-.248	.020	.154	.139	.335	.125	.930	.056	1.000	
68 TIT2	-.309	-.232	-.252	.152	.449	-.027	.062	.244	.808	.157	1.000

NUMBER OF OBSERVATIONS 200

END OF CORRELATIONS

APPENDIX G

ANALYSIS OF VARIANCE TABLES

ANALYSIS OF VARIANCE TABLES

The tables presented in this appendix are one-way analysis of variance tables used to determine the relationships between several background variables and time allocation measures used in the study. The number associated with each table corresponds to a t-test comparisons table found in the text for the same variables.

TABLE 3.3A

Analysis of Variance--Reading Class Length by School

(excluding specials)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	776862.6	1	776862.6	23677.2	.0000
Groups	5980.6	2	2990.3	91.1	.0000
Within Groups	5840.3	178	32.8		
Total	788683.5	181			

Eta Squared = .5059

Omega Squared = .4990

TABLE 3.4A

Analysis of Variance--Mathematics Class Length by School

(excluding specials)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	466992.0	1	466992.0	232925.9	.0000
Groups	8196.6	2	4098.3	2044.2	.0000
Within Groups	366.9	183	2.0		
Total	475555.5	186			

Eta Squared = .9573

Omega Squared = .9565

TABLE 3.8A

Analysis of Variance--Allocated Time in Reading

by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	22662570240.	1	22662570240.	20071.45	.0000
Groups	234196190.	2	117098095.	103.71	.0000
Within Groups	200978862.	178	1129095.		
Total	23097745408.	181			

Eta Squared = .5382

Omega Squared = .5316

TABLE 3.9A

Analysis of Variance--Allocated Time in Reading

by Reading Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	22662570752.	1	22662570752.	9593.01	.0000
Groups	14666360.	2	7333180.	3.10	.0473
Within Groups	420508164.	178	2362405.		
Total	23097745408.	181			

Eta Squared = .0337

Omega Squared = .0227

TABLE 3.11A

Analysis of Variance--Allocated Time in Mathematics

by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	13579862528.	1	13579862528.	72632.3	.0000
Groups	189661932.	2	94830966.	507.2	.0000
Within Groups	34215014.	183	186967.		
Total	13803739392.	186			

Eta Squared = .8472

Omega Squared = .8448

TABLE 3.12A

Analysis of Variance--Allocated Time in Mathematics

by Mathematics Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	13579861504.	1	13579861504.	11270.56	.0000
Groups	3381846.	2	1690923.	1.40	.2484
Within Groups	220496102.	183	1204897.		
Total	13803739392.	186			

Eta Squared = .0151

Omega Squared = .0043

TABLE 3.15A

Analysis of Variance--Percentage of Time on Task

in Reading by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	736.4	1	736.379	16799.3	.0000
Groups	1.1	2	.554	12.6	.0000
Within Groups	7.8	178	.044		
Total	745.3	181			

Eta Squared = .1244

Omega Squared = .1140

TABLE 3.16A

Analysis of Variance--Percentage of Time on Task

in Mathematics by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	657.7	1	657.728	14726.3	.0000
Groups	2.5	2	1.261	28.24	.0000
Within Groups	8.2	183	.045		
Total	668.4	186			

Eta Squared = .2359

Omega Squared = .2266

TABLE 3.17A

Analysis of Variance--Percentage of Time on Task

in Reading by Reading Teacher

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	736.38	1	736.380	21750.76	.0000
Groups	3.12	9	.347	10.24	.0000
Within Groups	5.79	171	.034		
Total	745.29	181			

Eta Squared = .3503

Omega Squared = .3149

TABLE 3.18A

Analysis of Variance--Percentage of Time on Task

in Mathematics by Mathematics Teacher

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	657.73	1	657.728	17448.9	.0000
Groups	4.06	9	.451	12.0	.0000
Within Groups	6.63	176	.038		
Total	668.42	186			

Eta Squared = .3797

Omega Squared = .3468

TABLE 3.19A

Analysis of Variance--Percentage of Time on Task

in Reading by Sex

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	736.379	1	736.379	14816.10	.0000
Groups	.014	1	.014	.29	.5908
Within Groups	8.897	179	.049		
Total	745.290	181			

Eta Squared = .0016

Omega Squared = -.0039

TABLE 3.20A

Analysis of Variance--Percentage of Time on Task

in Mathematics by Sex

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	657.728	1	657.728	11553.53	.0000
Groups	.221	1	.221	3.89	.0501
Within Groups	10.475	184	.057		
Total	668.424	186			

Eta Squared = .0207

Omega Squared = .0153

TABLE 3.21A

Analysis of Variance--Percentage of Time on Task

in Reading by Reading Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	736.380	1	736.380	15416.80	.0000
Groups	.409	2	.204	4.28	.0153
Within Groups	8.502	178	.048		
Total	745.290	181			

Eta Squared = .0459

Omega Squared = .0350

TABLE 3.22A

Analysis of Variance--Percentage of Time on Task

in Mathematics by Mathematics Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	657.728	1	657.728	11551.19	.0000
Groups	.276	2	.138	2.42	.0913
Within Groups	10.420	183	.057		
Total	668.424	186			

Eta Squared = .0258

Omega Squared = .0151

TABLE 3.24A

Analysis of Variance--Time on Task in Reading

by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	11362772736.	1	11362772736.	6064.51	.0000
Groups	33079626.	2	16539813.	8.83	.0002
Within Groups	333509992.	178	1873652.		
Total	11729362304.	181			

Eta Squared = .0902

Omega Squared = .0796

TABLE 3.25A

Analysis of Variance--Time on Task in Mathematics

by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	5700246720.	1	5700246720.	8284.32	.0000
Groups	127708065.	2	63854032.	92.80	.0000
Within Groups	125917958.	183	688076.		
Total	5953872768.	186			

Eta Squared = .5035

Omega Squared = .4968

TABLE 3.27A

Analysis of Variance--TTR1 by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	1808236032.	1	1808236032.	1145.28	.0000
Groups	9156986.	2	4578493.	2.90	.0576
Within Groups	281036780.	178	1578858.		
Total	2098429808.	181			

Eta Squared = .0316

Omega Squared = .0206

TABLE 3.28A

Analysis of Variance--TTR2 by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	5769329408.	1	5769329408.	833.97	.0000
Groups	28535004.	2	14267502.	2.06	.1302
Within Groups	1231388848.	178	6917915.		
Total	7029253248.	181			

Eta Squared = .0226

Omega Squared = .0116

TABLE 3.29A

Analysis of Variance--TTR3 by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	15914722.	1	15914722.	436.53	.0000
Groups	71689.	2	35844.	.98	.3761
Within Groups	6489360.	178	36457.		
Total	22475771.	181			

Eta Squared = .0109

Omega Squared = -.0002

TABLE 3.30A

Analysis of Variance--TTR1 by Reading Teacher

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	1808236432.	1	1808236432.	1581.49	.0000
Groups	94676667.	9	10519630.	9.20	.0000
Within Groups	195516704.	171	1143373.		
Total	2098429808.	181			

Eta Squared = .3263

Omega Squared = .2897

TABLE 3.31A

Analysis of Variance--TTR2 by Reading Teacher

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	5769330688.	1	5769330688.	1294.08	.0000
Groups	497560032.	9	55284448.	12.40	.0000
Within Groups	762362488.	171	4458260.		
Total	7029253248.	181			

Eta Squared = .3949

Omega Squared = .3618

TABLE 3.32A

Analysis of Variance--TTR3 by Reading Teacher

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	15914725.	1	15914725.	671.78	.0000
Groups	2509988.	9	278888.	11.77	.0000
Within Groups	4051058.	171	3690.		
Total	22475771.	181			

Eta Squared = .3826

Omega Squared = .3488

TABLE 3.33A

Analysis of Variance--TTR1 by Reading Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	1808236032.	1	1808236032.	1173.72	.0000
Groups	15967665.	2	7983832.	5.18	.0065
Within Groups	274226104.	178	1540596.		
Total	2098429808.	181			

Eta Squared = .0550

Omega Squared = .0442

TABLE 3.34A

Analysis of Variance--TTR2 by Reading Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	5769329472.	1	5769329472.	838.15	.0000
Groups	34679083.	2	17339542.	2.52	.0834
Within Groups	1225244672.	178	6883397.		
Total	7029253248.	181			

Eta Squared = .0275

Omega Squared = .0165

TABLE 3.35A

Analysis of Variance--TTR3 by Reading Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	15914722.	1	15914722.	516.17	.0000
Groups	1072845.	2	536422.	17.40	.0000
Within Groups	5488204.	178	30833.		
Total	22475771.	181			

Eta Squared = .1635

Omega Squared = .1534

TABLE 3.37A

Analysis of Variance--TTM1 by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	577833968.	1	577833968.	747.06	.0000
Groups	175812040.	2	87906020.	113.65	.0000
Within Groups	141546536.	183	773478.		
Total	895192544.	186			

Eta Squared = .5540

Omega Squared = .5478

TABLE 3.38A

Analysis of Variance--TTM2 by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	1041773200.	1	1041773200.	526.89	.0000
Groups	234422068.	2	117211034.	59.28	.0000
Within Groups	361830984.	183	1977218.		
Total	1638026256.	186			

Eta Squared = .3932

Omega Squared = .3852

TABLE 3.39A

Analysis of Variance--TTM1 By School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	10483014.	1	10483014.	195.86	.0000
Groups	409368.	2	204684.	3.82	.0236
Within Groups	9795482.	183	53527.		
Total	20688763.	186			

Eta Squared = .0401

Omega Squared = .0295

TABLE 3.40A

Analysis of Variance--TTM1 by Mathematics Teacher

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	577834104.	1	577834104.	1240.84	.0000
Groups	235388548.	9	26155394.	56.17	.0000
Within Groups	81959892.	176	465681.		
Total	895192544.	186			

Eta Squared = .7417

Omega Squared = .7275

TABLE 3.41A

Analysis of Variance--TTM2 by Mathematics Teacher

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	1041773432.	1	1041773432.	1203.25	.0000
Groups	443872084.	9	49319120.	56.96	.0000
Within Groups	152380740.	176	865800.		
Total	1638026256.	186			

Eta Squared = .7444

Omega Squared = .7303

TABLE 3.42A

Analysis of Variance--TTM3 by Mathematics Teacher

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	10483915.	1	10483915.	257.50	.0000
Groups	3039252.	9	337895.	8.29	.0000
Within Groups	7165596.	176	40714.		
Total	20688763.	186			

Eta Squared = .2978

Omega Squared = .2609

TABLE 3.43A

Analysis of Variance--TTM1 by Mathematics Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	577833880.	1	577833880.	368.22	.0000
Groups	30179955.	2	15089978.	9.62	.0001
Within Groups	287178712.	183	1569283.		
Total	895192544.	186			

Eta Squared = .0951

Omega Squared = .0848

TABLE 3.44A

Analysis of Variance--TTM2 by Mathematics Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	1041773104.	1	1041773104.	370.11	.0000
Groups	81156629.	2	40578314.	14.42	.0000
Within Groups	515096520.	183	2814735.		
Total	1638026256.	186			

Eta Squared = .1361

Omega Squared = .1261

TABLE 3.45A

Analysis of Variance--TTM3 by Mathematics Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	10483914.	1	10483914.	222.76	.0000
Groups	1592152.	2	796076.	16.91	.0000
Within Groups	8612698.	183	47064.		
Total	20688763.	186			

Eta Squared = .1560

Omega Squared = .1461

TABLE 3.47A

Analysis of Variance--Reading Gain by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	17469.09	1	17469.095	237.00	.0000
Groups	823.13	2	411.565	5.58	.0046
Within Groups	10982.48	149	73.708		
Total	29274.70	152			

Eta Squared = .0697

Omega Squared = .0569

TABLE 3.48A

Analysis of Variance--Reading Gain by Reading Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	17469.095	1	17469.095	221.12	.0000
Groups	34.127	2	17.064	.22	.8060
Within Groups	11771.478	149	79.003		
Total	29274.700	152			

Eta Squared = .0029

Omega Squared = -.0104

TABLE 3.50A

Analysis of Variance--Mathematics Gain by School

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	23601.72	1	23601.721	658.48	.0000
Groups	744.30	2	372.150	10.38	.0001
Within Groups	5519.76	154	35.843		
Total	29865.78	157			

Eta Squared = .1188

Omega Squared = .1068

TABLE 3.51A

Analysis of Variance--Mathematics Gain by

Mathematics Ability Level

Source	Sum of Squares	Degrees of Freedom	Mean Square	F-ratio	Significance Probability
Mean	23601.72	1	23601.721	600.22	.0000
Groups	208.46	2	104.230	2.65	.0738
Within Groups	6055.60	154	39.322		
Total	29865.78	157			

Eta Squared = .0333

Omega Squared = .0206

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